Journal of Gas Lighting and Water Supply

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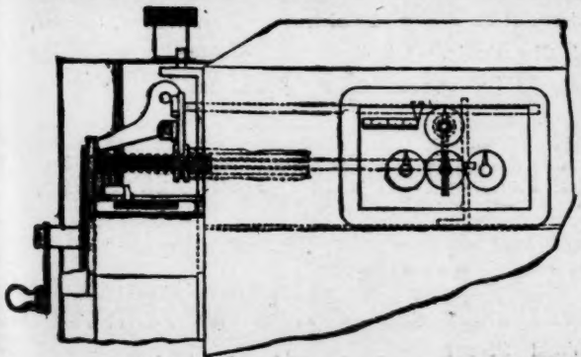

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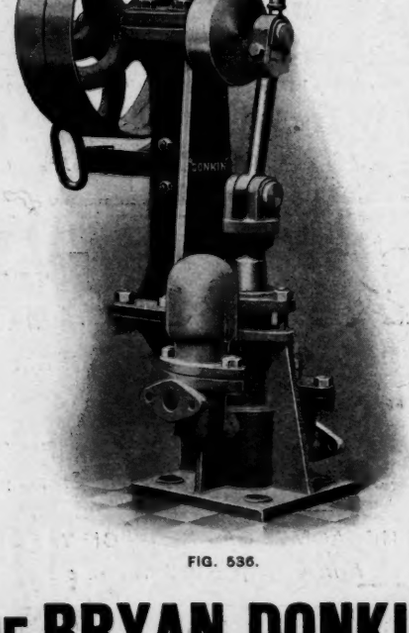

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EDITORIAL NOTES.

War-Time Comparisons from "Field."

THE exceptional conditions that are now ruling in the gas industry in consequence of the war will be the especial grounds for much regret that the Board of Trade, with the endorsement of Parliament, have determined to abandon for the war period the detailed returns relating to gas undertakings, and only publish the totals of salient items, as has been done for 1914-15 [*ante*, pp. 103, 108]. The Board may say that the unprecedented circumstances in which the industry is operating destroy the value of the returns for all normal comparisons. This may be so; but the abandonment of the returns also deprives those concerned of the interest—historical and otherwise—of the statistical tale of the industry's fortunes during this unparalleled period. But economy of time and money is as necessary in Government Departments as in other spheres, although the "man in the "street" and certain newspapers that are given to finding cut the chinks in Governmental armour, are prone to accuse the departments in and about Whitehall of being "penny "wise and pound foolish" in many of their notions and practices of economy.

However, in this particular matter of the gas undertakings returns, the best must be made of any deprivation and disappointment that expediency in relation to economy imposes. But we still have left "Field's Analysis" to give a partial analytical—partial in respect of the entire statutory gas industry—view of the effects of the war in comparison with pre-war, and later on in post-war, years. The issue of the "Analysis"—the compilation of which is now in the able hands of Mr. Herbert E. Ibbs, the Accountant of the Gas Light and Coke Company—for 1915 was recently announced; and if this work is critically examined for the purpose of ascertaining some of the effects of the war conditions upon the undertakings dealt with, a large amount of interest can, by comparison with 1913, be extracted from it. It would be too much to traverse here the data item by item; but a few of them will throw into relief certain of the variations occasioned by the war.

In the first place, as to capital, it is found that the average of the capital employed by the three Metropolitan Companies rose from 10s. 1d. per 1000 cubic feet of gas sold in 1913 to 10s. 5d. in 1915—the figures for the Gas Light and Coke Company having moved up from 11s. 2d. to 11s. 6d., and for the South Metropolitan Company from 8s. 3d. to 8s. 10d., while the Commercial Gas Company's figure was stationary at 8s. 6d. The ascent of the capital is, of course, due to the descent of the quantity of gas sold—namely, from 43,922,191,000 cubic feet in 1913 to 42,634,138,000 cubic feet in 1915, or a reduction of 1,288,053,000 cubic feet. In the case of the eight Suburban Companies—Brentford, Croydon, Hornsey, Lea Bridge, Richmond, South Suburban, Tottenham, and Wandsworth—the average capital employed per 1000 cubic feet sold was raised from 8s. 4d. to 8s. 7d.; but the Companies enjoyed an aggregate increase in gas sales of 1,158,645,000 cubic feet—the totals being 12,542,193,000 cubic feet in 1913, and 13,700,838,000 cubic feet in 1915. The eleven Municipal Corporations—Birmingham, Bolton, Bradford, Carlisle, Leeds, Leicester, Manchester, Nottingham, Oldham, Salford, and Widnes—showed a reduction in the capital employed (not the outstanding debt) from 10s. 4d. to 9s. 11d. per 1000 cubic feet. In this case, again, 1915 presented a good increase in gas sales over 1913—1,999,922,000 cubic feet; the actual sales having been 27,768,134,000 cubic feet in 1913, compared with 29,768,056,000 cubic feet in 1915. But 1913 did not include Widnes, as did 1915, with its average of 6s. 4d. of capital employed per 1000 cubic feet sold, and its sale of 458,451,000 cubic feet of gas. The nine Provincial Companies dealt with—Bath, Brighton, Bristol, Derby, Newcastle, Plymouth, Portsea, Rochester, Sheffield—showed a reduction of capital employed from 8s. 11d. to 8s. 5d. per 1000 cubic feet sold. Here, again, there was an excellent increase in the sales of gas—viz., 1,386,310,000 cubic feet, or from 16,863,128,000 cubic feet in 1913 to 18,249,438,000 cubic feet in 1915. The effect of the lowering of dividends in the case of companies under the sliding-scale is seen in the portion of the "Analysis" treating of the total capital charges. Notwithstanding the increase in the capital employed by the Metropolitan Companies per 1000 cubic feet of gas sold, the average of the capital charges on the same basis descended from 9·75d. in 1913 to 9·04d. in 1915. But it ought to be mentioned that the individual charges of the three Companies in 1913 were: Gaslight Company 10·93d., South Metropolitan Company 7·53d., and Commercial Company 9·06d.; while last year they were 10·19d., 6·89d., and 8·30d. In the case of the Suburban Companies, there was a reduction of the capital charges from 7·44d. in 1913 to 7·37d. in 1915; but those of the Provincial Corporations increased from 2·88d. to 3·51d., while those of the Provincial Companies receded from 6·45d. to 6·10d.

The figures already quoted as to gas sales, it will be remarked, show a reduction only in the case of the three Metropolitan Gas Companies; and increases for the Suburban Gas Companies, and Provincial Corporations and Companies, the curtailments of street and shop lighting notwithstanding. In view of this condition, it is of interest to observe that the three Metropolitan Companies reduced their consumption of coal from 3,301,311 tons in 1913 to 2,866,775 tons in 1915—a drop in demand of 434,536 tons. In the case of the eight Suburban Companies, there was a reduction, despite the increase in gas sales, of 52,529 tons—from 847,813 tons to 795,284 tons. The two reductions together amounted to 487,065 tons; and this is not surprising in view of sea conveyance and freight troubles. The Provinces, however, as represented by the concerns named, took the contrary course. The Corporations augmented their use of coal by 108,218 tons—from 2,286,006 tons in 1913 to 2,394,224 tons in 1915. The Companies increased their consumption from 1,412,421 tons to 1,452,601 tons—an increase of 40,180 tons. But we doubt very much whether the comparatively large reduction of coal tonnage in and about London, and the relatively small increase in the case of the provincial undertakings, are being continued, in view of the present limited supplies and the high prices of oil.

Taking together the Gas Light and Coke and Commercial Companies, their oil consumption was on the grand scale in 1915—22,597,203 gallons, compared with 14,775,793 gallons in 1913; their combined make of carburetted water gas having been in the two years 9,343,752,000 cubic feet and 6,434,756,000 cubic feet respectively. The Suburban Companies were also heavy users of oil in 1915—10,942,285 gallons, as contrasted with 6,440,798 gallons in 1913; the production of carburetted water gas in the two years being respectively 4,754,163,000 and 2,838,560,000 cubic feet. On the other hand, the use of oil by the Provincial Corporations declined from 8,857,412 gallons in 1913 to 8,388,358 gallons in 1915, although the make of water gas was higher in 1915 (3,411,897,000 cubic feet) than in 1913 (3,168,664,000 cubic feet). But they reduced the consumption of oil per 1000 cubic feet of carburetted water gas made from 2·8 gallons in 1913 to 2·46 gallons in 1915. The Provincial Gas Companies, however, increased their use of oil from 5,835,870 gallons in 1913 to 6,923,407 gallons in 1915; while their make of carburetted water gas advanced from 2,254,217,000 cubic feet to 2,725,918,000 cubic feet. It is, as we have intimated, likely that we shall see the further change due to the war of a decline in the use of oil and an ascent in the quantity of coal carbonized; and not alone on the scores of the scarcity and the price of oil, but because, in these days

of stress in the fuel markets, of the value of coke for other purposes than gas making.

Taking the aggregate costs of coal and oil, and then the analyses which show the net cost of raw materials per 1000 cubic feet, we are faced with the difficulty of properly interpreting the figures comparatively, owing to the complications introduced by circumstances. For example, in no single instance did residuals in 1915 return so much per 1000 cubic feet of gas sold as in 1913, though, except in the case of Provincial Corporations, more than in 1914. The figures are, of course, affected by the quantity of coal carbonized, the amount of carburetted water gas made, the position of pitch, and so forth. Yet in 1913, coke was not so productive as in 1915. The Metropolitan and Suburban Companies were especially hard hit by coal and oil—more so than Provincial Corporations and Companies. In this we have the reflection of high freights. In 1915, the London Companies paid for coal and oil £3,418,258, compared with £2,868,498 in 1913. Per 1000 cubic feet sold, the cost of coal and oil was 19·24d. in 1915, and 15·67d. in 1913; the net costs being respectively 8·64d. (residuals 10·6d.) and 4·51d. (residuals 11·16d.). The Suburban Companies paid for coal and oil £1,071,540 in 1915, and £868,414 in 1913; the cost per 1000 cubic feet being 18·77d. in the former year, and 16·62d. in the latter, with net costs of 9·71d. (residuals 9·06d.) and 6·85d. (residuals 9·77d.). The Provincial costs are not so heavy, although the Corporations collectively did not do at all grandly last year with residuals. The authorities mentioned paid £1,758,112 for coal and oil, as against £1,499,339 in 1913, which figures respectively worked out to 14·17d. and 12·92d. per 1000 cubic feet, with net costs of 5·95d. (residuals 8·22d.) and 2·62d. (residuals 10·34d.). The Provincial Companies had last year an expenditure of £1,211,548 for coal and oil, and £1,051,106 in 1913, which figures average out to 15·93d. and 14·96 per 1000 cubic feet, with net costs of 6·18d. (residuals 9·75d.) and 4·87d. (residuals 10·09d.). These figures on the 1000 cubic feet of gas sold basis present the true position; but on the per ton of coal basis, one is apt to get, through the carburetted water-gas complication, a mistaken notion as to the value received for residuals, and a false impression as to its probable effect upon the total gas sales. It has been seen that, per 1000 cubic feet of gas, residuals returns last year fell below those for 1913; but in the case of the Companies the returns on the per ton of coal basis were higher. The residual products of the London Companies, per ton of coal carbonized, yielded last year 13s. 1·57d., and in 1913 12s. 4·49d.; Suburban Gas Companies, 13s. 0·12d., as against 12s. 0·52d.; Provincial Corporations, 8s. 6·21d., compared with 10s. 5·59d.; and Provincial Companies 10s. 2·5d., as against 10s. 0·41d. The low average figure for the Provincial Corporations does not do justice to all undertakings in the group. For instance, Leicester realized for residuals last year an average of 10s. 0·39d. per ton of coal.

However, throughout war time, the gas industry has had the satisfaction of seeing the basis of its business expanding. In each group of undertakings, save in that of the three Metropolitan concerns, it has been observed how, despite street-lighting restrictions, there was in 1915 an aggregate advance in the sales of gas compared with the normally conditioned year of 1913. This is very satisfactory, as it manifests the vitality of the industry, and is a guarantee for the future. During the war, too, the numbers of consumers and of stoves on hire have continued to advance at better pace than might have been anticipated. The three London Companies had 1,299,349 consumers connected, and 1,117,223 stoves on hire, at the end of 1915, which were movements upwards from 1,256,591 consumers, and 1,015,575 stoves on hire, in 1913. The Suburban Companies (Brentford having meantime annexed the Staines and Sunbury Companies' businesses) had in 1915 434,234 consumers, and 385,517 stoves on hire; the figures for 1913 being 391,632 consumers, and 312,889 stoves on hire. The Provincial Corporations had in 1915 913,982 consumers, and 490,786 stoves on hire; while in 1913, the figures were 877,266 consumers, and 342,453 stoves on hire. The Corporations have evidently been giving more attention to the heating business than formerly; for, notwithstanding the war, the stoves on hire show a particularly good upward trend. In the case of the Provincial Gas Companies, the number of consumers in 1915 was 501,694, while that of stoves on hire was 306,518; the corresponding figures for 1913 being 479,571 and 273,287.

One further point bearing upon the enlargement of the gas business may be dwelt upon, and we will then cease the present investigation of the figures in "Field." Save in the Metropolitan district, each group of undertakings shows an advance during the war period in the consumption per ordinary and prepayment consumer; so it may be taken for granted that there would have been a considerable flight in consumption increases had it not been for the street and shop lighting restrictions, though, on the other hand, these restrictions have no doubt meant more home life. However, the average consumption per ordinary consumer in the Metropolitan area in 1915 was 65,065 cubic feet, as compared with 68,410 cubic feet in 1913; while the average for the prepayment consumers was 16,440 cubic feet in 1915, and 16,516 in 1913. The Suburban Gas Companies have a much lower average than the Metropolitan Companies per ordinary consumer, and a higher one per prepayment consumer. Last year the average sale through ordinary gas-meters in the suburbs was 51,357 cubic feet, as against 50,966 cubic feet in 1913; the average prepayment consumption being respectively 18,105 cubic feet and 18,045 cubic feet. The Provincial Authorities exhibit the lowest averages—namely, per ordinary consumer in 1915 42,064 cubic feet, and in 1913 40,761 cubic feet; and per prepayment consumer 14,800 cubic feet in 1915, and 13,159 cubic feet in 1913. The Provincial Companies are better; the average for the ordinary consumers in 1915 being 49,683 cubic feet, and in 1913 46,845 cubic feet, while for the prepayment consumers the average was 15,879 cubic feet last year, and 14,304 cubic feet in 1913.

These are some of the lessons of "Field's Analysis." They show that the blows inflicted by the war have been heavy, but that the capacity of the industry for expansion asserts itself even with the impediments of war conditions environing.

Development of the Home Dye Industry.

THE report issued by the Directors of British Dyes Limited (which was noticed last week, p. 356) is, so far as it goes, exceedingly satisfactory; and it would have been more so if it had gone further, and had given some quantitative information, which would not have affected the financial statement and the settlement with the revenue authorities in respect of the duties payable under the Finance Act, 1916. Probably, however, it is deemed advisable, during the process of development, not to impart too much information to Germany, the dye producers of which will not, when opportunity offers, leave a stone unturned to bring about the ruin of the Company. But it is hoped that the patriotism of the users of dyes and colours will be proof against all the assaults of German competitors, which will have for their objective the retrieving of the valuable market with which the United Kingdom has hitherto provided them. On the other hand, patriotism must be subject to other considerations. The prosperity of the textile industries (which is quite as important to the nation as the prosperity of the dye-producing industry) rests upon not only patriotism, but the merits of the productions they offer at home as well as in other markets of the world; and one of these merits has very much to do with the qualitative character of the colouring materials they use.

This is where the report of British Dyes Limited is highly satisfactory to all concerned—no less to the producers of tar than to the users of the dyes. The efficiency of the concern depends upon organization; and the *personnel* of the organization on the technical side is being rounded-off in a manner which must meet with general approbation. With Professor W. H. Perkin at the head of the Research Department, with Dr. Forster as Chairman of the Committee of the heads of the Technical and Scientific Departments, with various other gentlemen of reputation concerned as members of the official staff, and (pending the erection at a more convenient time of a central research laboratory) with the co-operation in research work of the laboratories of the different universities, excellent results should progressively be achieved. But there is nothing to be gained by being over-exacting in the rate of accomplishment. Certain it is that the men who have been entrusted with the work of mobilizing the resources of the country in the matter of dyes and colours, and gradually making it independent of foreign sources of supply—especially independent of Germany—will use every endeavour to prove themselves worthy of the confidence that has been placed in them.

The Company appear to have sufficient capital for the

rate at which their work can be developed, seeing that the total issued is £1,928,358. Of this, £1,064,179 is a loan from the Government, and £864,179 represents the issue of £1 shares, of which only 10s. has been called up. This comparatively small share issue for such a large work is not a monument to the sportsmanlike instinct of the users of dyes and colours, nor to their patriotism. There must be some extraordinary confidence existing among them that Germany will again get the ascendant in this country in this direction through superior resources. But future ascendancy depends on two things—first, the patronage of the users of dyes and colours; and, secondly, the ability of the Germans to procure the necessary raw materials to maintain on the old scale their output of products. They will find the British market for raw material hereafter largely, if not completely, closed to them; we have now uses for our own tar production. The gas industry at all events will prefer home customers to German ones; and the gas industry is seeing to it that in future it will have a voice in the disposal of its tar, by itself entering to a very considerable degree into, at any rate, first-stage distillation for the recovery of those very substances that the German dye manufacturers cannot do without.

It is not only this country against which the German makers will have to contend, but France, whose chemical and dye industries have suffered very severely from German competition. The increase of the number of factories (especially those engaged in the production of explosives), and of experimental laboratories, together with the additional plant that has been put down at the gas-works for the provision of benzol and toluol, has given new hope of more than a recovery of lost ground in the manufacture of chemicals and dyes, through the turning-over to these purposes after the war of factories, laboratories, and plants. Quite a number of useful Associations have been formed in France, with the view of making all the preliminary arrangements for developing opportunity; and, with one of these, Le Syndicat National des Matières Colorantes, a working agreement has been completed by British Dyes Limited in regard to the production of intermediates and dyes. The power of international organization in this matter cannot be over-estimated. It will be valuable in showing a stiff back to German devices and subterfuge to recover the lost place in the dye and colour markets. The fullest co-operation that can now be arranged between all countries will increase the strength to meet the competition of the German producers. They have done well in the past out of the dye and colour business with other countries; other countries have now a fancy for doing business on their own account at home, and for sharing in the export business. It will be a new world with new ideas, new aspirations, new organizations, into which the German dye and colour producers will emerge at the close of the war.

Coal Supplies.

The position in connection with coal deliveries appears to have become a little easier; and several gas engineers who were looking to next winter with feelings of dread are beginning to show a little more confidence and hopefulness. The report from various gas-works is that stocks are commencing to accumulate at a somewhat faster rate; and, if this continues, the coming winter will be entered upon with less anxiety than was the case last winter. We hope sincerely that this is so. But where greater happiness prevails owing to the rays of sunshine through the clouds, the old exhortation as to making hay should not be forgotten, as winter brings its troubles with transport as well as its increased and pressing demands for coal for heating purposes. For two weeks in succession the "Iron and Coal "Trades Review" has in its market reports made reference to the more plentiful quantity of coal available for home consumption; and it persists in attributing this mainly to the control exercised by the Exports Committee in limiting the issue of licences. "In Scotland, indeed," writes our contemporary, "the restriction seems to have been carried "too far, inasmuch as at least some of the collieries are "accumulating stocks, and there is a talk of the suspen-"sion of operations unless outlets improve." This indeed is excellent news for home users, because many coal proprietors have played too long and constantly on the "short-"age" string as an excuse for high prices, for abuse of their contractual obligations, and for avoiding the terms of the Price of Coal (Limitation) Act. If our contemporary will only study the returns as to exports for the two war years (ending in July), it will see that there was very little difference between the total exports of the two periods; so that it must look somewhere else for the reason for the more plentiful supplies for home use. Probably it will find the reason in the wisdom of coalowners in appreciating that they cannot longer hoodwink the country as to shortage, taking into account the reduced export. Besides the very point made by our contemporary, if true, shows that with a regulated export there need never have been any shortage in this country, no starving of industries, and no such prices for home use as those quoted and commanded.

The question has again been raised in the House of Commons as to the grounds upon which the Board of Trade granted the South Wales owners the addition of 2s. 6d. to the standard excess of 4s. per ton upon 1913-14 rates; but the Board of Trade are astute enough not to give away any details, so that their decision can be traversed. Mr. Pretyman's reply to his interrogator was that the extra 2s. 6d. was only granted after the production of proof that the expenses had grown by at least that sum. We must leave the matter at that. It is, however, a satisfaction to know that the Board have not yet received requests from other colliery districts, save from the Forest of Dean, for an addition to the 4s. But this can only be for the want of unanimity among the colliery owners, or the fear of rejection in view of the resentment shown in connection with the South Wales concession; for there has been enough talk as to this course being taken. Upon the question as to the evasion of the Price of Coal (Limitation) Act, it seems that the Parliamentary Secretary to the Board must have been listening to further excuses from the colliery owners. They have evidently been telling him that, "It is not us, but the "other fellows" who have been guilty of transgression in this regard. The Parliamentary Secretary has told the House that consumers were to blame for what has taken place in respect of payments above the maximum. They went to the colliery owners, and said: "We want coal "badly. If you will let us have it, we will give you some-"thing above the maximum." The poor colliery owners, or rather some of them, have been suffering so terribly through not having been able to make as much profit out of the war as they would have liked to have done that they have been unable to lift up their hands in pious indignation at the temptation held out to them. They are willing delinquents where the making of an additional profit is concerned; and they do not dissemble their gratification at a profitable evasion of the Act, and the illegality certainly does not trouble them. But if they look at the matter from the point of view of those who offer them something above the maximum, they will see that those persons know that the owners have coal which they can sell and deliver, but that a price must be offered above the maximum in order to get it. The "dog in the manger" is usually an object of contempt.

One other matter. In view of the heavy prices that British companies carrying on gas undertakings in Allied countries have had to pay for coal delivered—prices that, under the gas-supply concessions, could not be counterbalanced by increasing the price of gas, without special authority—it is gratifying to see that the arrangement entered into with France as to the limitation of coal prices and of freight rates is, considering the current circumstances, giving satisfaction, and that now a scheme is in preparation for the control of both coal and freight charges for Italy, Spain, and Portugal. It was about time that something was done in this way, as in Italy, for example, the term "Ally" was getting a bit tarnished by the heavy profits that were being demanded on British coal and transport. British shipowners were not alone in this. The Italian ones were equally alive to securing the highest possible rates even from their own countrymen. But, as was pointed out at the last meeting of the Continental Union Gas Company, with the then freights to Genoa of upwards of 80s., the cost of coal, by the time it was delivered at the Milan Gas-Works, was something like £6 per ton, which is rather steep for gas-making purposes. However, there is now to be limitation; and the scheme is under way. Freights to Genoa have, since the outcry of a little time since, diminished to (say) something above 60s. But the schedule of freights from the Bristol Channel ports, submitted to Mr. Runciman by the shipowners as the maximum that should be allowed, suggests that the latter find some difficulty in even partially closing their mouths, for the

maximum proposed for Genoa is 65s. per ton. Where there is price or rate regulation, it is curious to notice how most coal proprietors and shipowners find the maximum fascinating and linger round about it. Take 65s. per ton as the rate to Genoa, the additional costs per ton before there is delivery on to works, together with the price of the coal, mean not far off £5 per ton under the most favourable circumstances. The gas business cannot forge ahead with coal at that price.

Applications under the Calorific Value Standard Act.

There has not yet been a rush of public notices of intention to apply to the Board of Trade or to the Local Government Board (as the case may be) for the substitution of the calorific value standard for the illuminating power one under the Standard of Calorific Power Act. The main reason for this is probably that many local authorities are now enjoying a recess, and companies are busy with their half-yearly meetings. There are also preliminaries to be attended to, so that it is a bit early to expect to see any immediate considerable result from the passing of the Act. The Sheffield United Gaslight Company are one of the first with a public notice of an application to the Board of Trade. They seek the repeal of all provisions of their Acts and Orders referring to the illuminating power standard, and the setting-up in lieu thereof of a calorific power standard of a total (or gross) heat value of 500 B.Th.U. The Directors of the Croydon Gas Company and of the Wellingborough Gas Company have also practically decided to give notice; and no doubt many other Gas Boards and Committees have done likewise, but the matter has not yet received the necessary publicity.

Co-Partners in Collusion with their Employers.

Employee co-partners will smile at the above heading. Of course, they are in collusion with their employers, not for wrongdoing, but for accomplishing the best possible for the undertakings they serve; and the "best possible" for the undertakings is to give the customers every satisfaction. In giving satisfaction to the consumers, there is profit. In a district near London, there has recently been newspaper complaint as to the registrations of gas-meters; and the local "Sentinel," which enjoys the subtitle of the "Finsbury Park to Finchley and Enfield Advertiser," has made comment upon some of the correspondence. The writer of the comment seems to have a very narrow opinion of employee co-partners. Evidently he does not think that they know much about, or apply to their work, the principle "Honesty is the best policy;" or, to put the matter another way, he is inclined to the view (unless we have misconstrued his meaning) that some of the co-partners have become so depraved under the system that they are quite capable of consciously defrauding the consumers in an attempt to protect their own interests. This was not one of the intentions of the introduction of profit-sharing. Lest, however, we have mistaken the "Sentinel" writer's meaning, his own words may be quoted, so that others may put their own interpretation upon them: "We are afraid that some of the employees at any rate have no interest in securing justice for the consumer in the matter of meter readings, for they are 'co-partners' sharing in the profits, with a selfish reason for winking at anything that will increase the Company's gains without at the same time putting up the nominal price."

A Scale of Charges for Natural Gas.

As the result of practical experiments, to ascertain just what rates would be necessary to meet the competition of fuels formerly in use, the Economic Gas Company of Los Angeles, California, who are supplying straight natural gas of approximately 900 B.Th.U. calorific value, have drawn up a scale of charges on a volumetric and classified basis; the various rates quoted being for minimum monthly bills of different amounts. In all there are six classes; the first, and highest in price, relating to ordinary domestic consumption, and having preference over all others. In this, for the first 3000 cubic feet per month, the charge is 64½ c. per 1000 cubic feet; and for all over 25,000 cubic feet, 50 c. The other classes are for house and water heating and industrial and commercial uses; the cheapest supply being, under certain conditions, 20 c. per 1000 cubic feet for a minimum monthly bill of $100 to industrial consumers. The special conditions are that if the Company are unable to supply the full requirements of all classes, this section will be the first to be shut off; and the consumers are to provide their own storage and to draw gas from the mains only between the hours of 10 p.m. and 5 a.m. All the classes except the first, domestic, one are to advance funds to cover the cost of meter and governor installations; these advances to be refunded by the Company in monthly payments amounting to 10 per cent. of bills for gas used through the meters for the month. Previous to the compilation of this scale, the Company were charging a uniform price of 64½ c. per 1000 cubic feet for their natural gas; and the figures now quoted are particularly interesting as being the result of a great deal of study, and based, as already stated, on actual practical experiments.

Arriving at the Basis.

As to these experiments, it may be said in the first place that Los Angeles is so situated that gas has to compete with oils and distillates sold at prices lower than in most other parts of the country, while coal is unusually costly. Until the Economic Gas Company turned straight natural gas into their mains about a year ago, Los Angeles had only been served with artificial and mixed gas. This was the position of affairs when the Company devised their novel method of ascertaining what rates of charge would be equitable and would enable gas to compete with other fuels in use. Experiments were conducted on consumers' premises in work which had hitherto been carried out with other fuel. The same appliances were employed; and, while the consumers were cautioned against wasting gas, they were told to use it just as they had used their other fuels. The installations experimented with were in industrial and commercial establishments, as well as in private residences and apartment houses; and, of course, a careful record was made of the results obtained under the same working conditions as before. The experiments were carried out at the expense of the Company, who provided the gas and all labour incidental to the installations; the people on whose premises they were conducted paying the Company in return as much as the fuel which was superseded by gas had previously cost them. The Company are to be commended for the trouble they have taken to find out what is fair between them and their customers. By the method adopted, it was possible to arrive at definite conclusions with regard to rates necessary to secure business; time will no doubt show that the figures arrived at are such as to ensure to the Company that margin of profit for which their enterprise entitles them to look. Whatever may be the views of their competitors on the subject, the Company themselves are satisfied, from the investigations of engineers and gas experts, that there is at any rate an adequate supply of natural gas in the field.

America Profits from Benzol and Toluol.

America has hugely profited from the war in many directions—among others, from benzol and toluol. The prices realized will make home producers' mouths water. Here the Government have commandeered all the benzol and the toluol; and, at the regulated prices, they do not give much scope for profit-making. The gas industry has to think and act (and does so willingly) patriotically, and be thankful it is able to do something for the country's good, and this without lining its coffers with gold. But we are a very curious nation, with complex ideas and actions. While the producers are allowed by the Government only a certain price for benzol and toluol, the gas undertakings are the victims of profit-grabbing in relation to coal and freights. Many of those who come under the Act intended to regulate the price of coal have found means of disobeying it; and those who own ships are permitted the grossest of licence in the rates they charge. America suffers from no restrictions in connection with their prices for materials for war purposes; and, as said, producers have done well there in respect of benzol and toluol—so much so that gas producers, as in this country, have adopted the new fashion of developing their benzol and toluol resources. In the paper that Mr. W. H. Childs read before the American Iron and Steel Institute in May last, on "Bye-Products Recovered in the Manufacture of Coke," he stated that toluol had jumped up from 30 c. per gallon to $4.50, or upwards. Benzol suddenly climbed up from 25 c. to 80 c. per gallon, as the basis of synthetic phenol for making picric acid, and for the manufacture of analine oil. The estimated figures for the production of light oils from gas washing, so far as obtainable by Mr. Childs, indicate that in 1914 about

6 million gallons were made, and in 1915 about 14 million gallons. For 1916, if all the existing works and those expected to come into operation are kept in service, it is anticipated that the output will exceed 22 million gallons.

Coke Sales and the Coming Winter.

Those gas managers who have now a stock of coke on hand are as much to be envied as, if not more so than, those who have clear yards; for everything points to the coming winter being one in which the demand for coke will, through the conditions ruling in the coal markets, be on the large scale. But now is the time to commence developing local sales, as it will be inconvenient to have a plethora of orders coming in when the shorter and colder days are upon us, especially with the difficulties of a deficiency of labour and of cartage facilities. The South Suburban Gas Company, we see, some weeks ago circularized residents in their supply area, respectfully urging those who are likely to require a supply of coke to lay in a stock during the summer and early autumn months; and they use the experiences of last winter as a warning. "Last winter," they remark, "the Company experienced the greatest difficulty in executing orders for coke, owing to the unprecedented demand for this fuel, and to the impossibility of obtaining adequate means of transport. This trouble and inconvenience will be minimized if consumers will kindly anticipate their requirements as suggested."

Percentage Increased Cost of Fuel and Light.

A recent Government calculation, based upon returns from towns of upwards of 50,000 population, shows that the war has increased the cost of living by practically one-half. The percentage of increase on the cost of food is placed at 65; this having been gradually reached from 11 per cent. increase in September, 1914. In the return, "fuel and light" are charged with having increased 20 per cent. by July, 1915; and the percentage stood at 40 in June this year. Clothing has gone up considerably—by 55 per cent.; and miscellaneous items by 30 per cent. In July, 1915, £1 was worth only 16s., compared with the immediate pre-war period; by June this year, the value had descended to between 13s. 9d. and 13s. 4d.; while it is now declared to be only 12s. 1d. The revenue from gas used for fuel and light is not showing anything like an average increase of 40 per cent.; but unfortunately the gas industry's part as suppliers of fuel and light is, in the return, mixed up with that of the vendors of coal, for some of whom the industry has no great respect at the present time, for reasons that have been frequently referred to in these columns.

Coal Carbonization.

The economics of coal carbonization are dealt with by Mr. F. D. Marshall in an article appearing in the current issue of "The Times Engineering Supplement." In this, he says that, whether the coal be treated by the existing high-temperature processes or on the low-temperature system, the coke should be gasified in producers to make power gas; and this should be converted into electricity. The recovery of the ammonia would practically pay for the cost of gasifying the coke. Each ton of coke gasified would yield about 130,000 cubic feet of power gas of 130 to 140 B.Th.U. Every 130 cubic feet of this gas, used in a good gas-engine coupled to an electric generator, would yield a Board of Trade electrical unit; and 200 cubic feet, used under boilers to provide steam for a turbine-driven electrical plant, would likewise yield a unit. Hence, with power gas at a mere nominal price, the only costs to be covered would be those of running the plant, supervision, amortization, &c.; and these are such that it is estimated it would be possible to deliver electricity in bulk at 0·062d. per KW. hour. This would bring electrical heating and lighting within the reach of all. The gas companies would not suffer by the loss of revenue from the sale of illuminating gas. Their future lies in the distribution of gaseous fuel, which they could continue to carry out from their existing plants, now that the calorific instead of the illuminating standard of gas quality is to be adopted. But if, instead of exporting vast quantities of coke, as they did before the war, they would gasify this coke (recovering the ammonia), they would be in a position, the necessary statutory powers being assumed, either to supply cheap electricity themselves or to provide cheap gaseous fuel to the existing electrical companies.

Tests are being carried out at Burythorpe, on the East Yorkshire Wolds, on an estate where a rich bed of silica, extending over many acres, has been found. In view of the war having restricted the supply of silica from France, the new discovery is attended with important possibilities. Already in the neighbourhood large quantities of silica have been secured.

PERSONAL.

Mr. James Watson, the Bradford Water-Works Engineer, has received information from his son, Lieutenant LIONEL WATSON—whose death had been feared—that he is a prisoner of war in Germany, and is well. He is being well treated.

Next Friday the North British Association hold their annual meeting in Edinburgh, under the presidency of Mr. ALEXANDER MASTERTON, Engineer and Manager to the Edinburgh and Leith Corporations' Gas Commissioners. Mr. Masterton was trained as a civil engineer under the late Mr. John Macrae, M.Inst.C.E., of Edinburgh, and he also acted as assistant to the late Mr. Alexander C. Boothby, Assoc.M.Inst.C.E., of Kirkcaldy and Cupar-Fife. In 1885 he joined the staff of the Edinburgh Gaslight Company, which undertaking was acquired by the Edinburgh and Leith Corporations' Gas Commissioners in 1888; and thereafter he was appointed Assistant Engineer and Manager to the late Mr. Robert Mitchell at the New Street Gas-Works. In 1897, when Mr. W. R. Herring became Chief Engineer and Manager, he acted as Station Manager at the New Street works. Then when, in 1910, Mr. Herring resigned to take up consulting work in London, Mr. Masterton was elected to the position of Engineer and Manager to the Gas Commmissioners, which office he still holds.

OBITUARY.

JOHN HAMMOND.

THE improvement in his health which had been hoped for when, two years ago, Mr. John Hammond retired from the position he had held for 27 years as Resident Engineer and Manager of the Eastbourne Gas Company, did not, unfortunately, come about. It was failing health which compelled his retirement; and subsequently increasing debility confined him more and more closely to his home. For several months he had not been out of doors; and he passed peacefully away early last Friday morning, at Eastbourne, aged 74 years.

Though well known in other directions in the gas industry, the principal work of the deceased gentleman was, of course, in connection with the Eastbourne Gas Company; and it is pleasing to reflect that, though he himself is gone, the position which he held there is now occupied by his son, Mr. William H. Hammond. Previous to going to Eastbourne, Mr. John Hammond was Manager of the gas-works at Bognor (his native town), and then at Lewes, where he remained for eleven years. The record of his work at Eastbourne is, to a really large extent, that of the wonderful progress of the Company; and in this connection it may be stated that in 1893 he was presented with a handsome gold watch by Mr. H. E. Jones, the Company's Consulting Engineer, who, in an accompanying letter, acknowledged in very high terms the assistance rendered to him by Mr. Hammond. On his retirement, too, the Directors placed on record their appreciation of the 27 years of strenuous service rendered by him to the Company; while the works staff and employees handed to him an illuminated address and an album containing the subscribers' names. This was well-deserved testimony to Mr. Hammond's influence in the excellent relations which had always existed between the Company and their employees. His kindly, sympathetic manner naturally endeared him to those who worked under him.

Mr. Hammond's researches and inventive genius in various directions made his name familiar in the profession—for instance, as a pioneer in the purification of gas by ammonia, and as the designer of a retort-furnace which has earned popularity on the score of economy of fuel. A drawing from a patent of his for the complete purification of coal gas by concentrated liquid ammonia and the recovery of the sulphur and ammonia [No. 8348 of 1886] was included in the last communications of the late Mr. William Young, as appearing in the "JOURNAL" in the early part of 1909. One scheme of his outside the gas industry of which mention may be made was for the construction of a small mercantile harbour at Eastbourne. This project, however, fell through owing to lack of the material support that was needed to carry it out.

Mr. Hammond, who was twice married, is survived by his second wife, to whom, and to the family, sympathy is extended in their bereavement. In addition to several sons, there is a daughter, who is the wife of Mr. T. N. Ritson, the Engineer and Manager of the Chichester Gas Company.

The funeral took place yesterday, at Langney Cemetery.

Mr. JOHN CHAMPION, Secretary of the Camborne Water Company, who died last Saturday week, had been connected with the undertaking over a lengthy period. For some time he had been in failing health.

The death is announced of Mr. JOHN MULLINS, Solicitor, who was Chairman of the Cirencester Gas Company. He was 86 years of age, and was regarded as the oldest practising solicitor in Gloucestershire.

Second-Lieutenant GEORGE RUTHERFORD ANDERSON, who was killed in action on the 18th inst., was 21 years of age. Previous to the war, he was a civil engineer with the late Lieutenant

Colonel Henry O'Connor, commanding the Forth Royal Garrison Artillery.

Second-Lieutenant JOHN E. P. COCKEY, of the Liverpool Regiment, who was recently reported missing, and is now known to have been killed, was the only son of Dr. E. Cockey, of Frome, Somerset. He gave up a business position in London to take a Commission, and had quite recently gone to the front.

Mr. ASHWORTH PINDER, Foreman and Under Manager at the Lancaster Corporation Gas-Works, lost his life in a recent boating mishap in the estuary of the River Lune, in Morecambe Bay. He was one of a party of eight, seven of whom were drowned. Mr. Pinder, who was a native of Wigan, leaves a widow and two children.

Captain, and recently gazetted Temporary Major, EDWARD W. EDWARDS, of the Monmouthshire Regiment, who is officially reported killed in action, had for seven years been Surveyor and Water-Works Engineer to the Blaenavon Urban District Council. He joined the Monmouthshire Regiment (T.F.) as Second-Lieutenant, and was very soon promoted Lieutenant. During his career as Engineer, he served the Wandsworth Borough Council and the Pontypridd Urban District Council before settling at Blaenavon.

Second-Lieutenant ALEXANDER FRAZER, of the Highland Light Infantry, who was killed in action on the 13th inst., was the second son of Mr. John Frazer, the Manager of the Dalmarnock Gas-Works of the Glasgow Corporation. As a member of the Lanarkshire Yeomanry, Lieutenant Frazer was mobilized in August, 1914, and later received a Commission. He was awarded the Military Cross for conspicuous gallantry on the night of July 5, when he led his company right up to the German wire before being discovered, and stormed and took the trench after a stiff fight.

IMPERIAL CONTINENTAL GAS-WORKS IN BERLIN.

Reported Action by Germany.

AT the end of last week, the statement reached this country, through Amsterdam, that, as a reprisal for the liquidation of German firms in England, the German Chancellor had ordered the liquidation of eleven British firms in Berlin, including the Imperial Continental Gas Association and the gas undertakings at Oberspree and Grunau, which belong entirely to the Association. We learn, however, on inquiry as to the truth of the statement as affecting their undertakings, that no official intimation on the matter has yet reached the London Offices of the Association. No doubt, when definite news does come to hand, there will be a statement on the subject from the Board.

Meanwhile, even if the announcement made should prove to be true, there does not, on first thoughts, appear necessarily to be anything in it which should give cause to serious anxiety on the part of the proprietors. It was stated in the "Vossische Zeitung" early this month that the Bundesrat [Federal Council] had issued on July 31 a decree which empowers the Chancellor to order the liquidation of undertakings in Germany the capital of which is held preponderantly by British subjects, or which are controlled or managed from British territory. The liquidation may apply to branch establishments of an undertaking; and British interests in any undertaking may also be compulsorily liquidated. The liquidator may sell the undertaking as a whole, or the British interests in it; and "the results of such liquidation, from which first of all the costs of liquidation are to be covered, will, so far as they belong to British subjects, be placed on deposit." To British interested parties living in Germany, payments necessary for their maintenance may be made subject to the permission of the Provincial Central Authorities. Referring to the matter, too, the "Norddeutsche Allgemeine Zeitung" says that, as a reprisal, the Federal Council have passed this decree, which in a general way follows the British law of Jan. 21, 1916, but with the difference that, while the British law binds the Government to order the liquidation of enemy undertakings, the order of the Federal Council leaves it to the discretion of the Imperial Chancellor whether or not a British undertaking is to be liquidated.

From these published statements with regard to the new law, it would seem that the intention is to invest the money resulting from liquidations, and after the war to hand it over to those to whom it belongs; and it is a well-known fact that the value of the Berlin undertaking of the Imperial Continental Gas Association is greater than the nominal capital of the Association. On the other hand, it must never be forgotten that, should the Germans break faith in this respect, our own Government have always, in the shape of enemy property in their hands, a weapon which can be effectively used against Germany. Thus, under the liquidation, the Association will, with the return of peace, have two possible ways of getting their money back.

An agent in Florence wishes, says the "Board of Trade Journal," to represent United Kingdom manufacturers of gas geysers and cookers. Inquiries should be addressed to the Secretary, British Chamber of Commerce for Italy, No. 7, Via Carlo Felice, Genoa—quoting number 1067.

GAS ACTS FOR 1916.

WHEN reviewing in January the Bills introduced in Parliament, it was mentioned that there were only a dozen or so that referred to gas. Since then there has been a withdrawal of two of the measures—that of the Beighton and District Gas Company, and that of the Northwich District Council, which was a Purchase Bill; and therefore there are only ten Acts now falling for notice. We shall only, as last year, indicate the changes that have been made during the parliamentary progress of the measures. The notices of the Bills appeared on Jan. 4, 11, and 18.

A considerable change has come over the face of the Aberdare and Aberaman Consumers' Gas Company's Bill. In the Act, we do not see the proposed powers for the conversion of the capital, nor for the purchase of the Hirwain Gas and Coke Company. The repeal was also sought of section 30 of the Act of 1869, which conferred upon the Local Board of Health (now the District Council) power to purchase the Company's undertaking at any time after the expiration of five years from the passing of the Act, on giving six months' notice in writing. The provision repealing the power has also been expunged. The additional capital granted is £35,000, and not the £36,000 sought. The auction clauses are in the ordinary form; the suggested exemption from them for five years, or such longer period as the Board of Trade might sanction, and liberty to create and issue such capital during that period at such prices and on such terms as thought fit, having been disallowed. The Company have been granted the right to issue redeemable preference shares or stock or debenture stock; but the creation of a redemption fund has not been permitted. Redemption may, however, be by paying off the shares or stock, or by (subject to the consent of the holders) substituting other shares or stock. For providing the money to pay off the shares or stock, or the shares or stock to be handed over in substitution, new shares or stock (either redeemable or irredeemable) may be created and issued, provided that the creation and issue for the purpose of any particular class of shares or stock does not make the total nominal amount of such shares or stock exceed the statutory amount. The Company are expressly prohibited from redeeming out of revenue any debenture stock or preference shares of that class of shares or stock which the Company are for the time being authorized to create. The dividend permitted on the additional capital is 7 per cent. on the ordinary and 6 per cent. on such part as is issued as preference. The sliding-scale clauses have been deleted. The borrowing powers in respect of the existing capital (including any sums already borrowed) are fixed at £13,333, together with one-third part of the amount of the additional capital. Regarding the calorific value standard (which is put at 500 B.Th.U., instead of the 475 B.Th.U. asked for), the District Council are to provide the testing apparatus, the form and the conditions of use of which are to be as prescribed by the Metropolitan Gas Referees. The Company are to supply, if required, free flat-flame burners within two years after the passing of the Act. Attached to the maintenance and construction of gas-works clause are the new model residual provisions; but, since the Bill was introduced, the one-third purchasing restriction has been incorporated. In clauses for the protection of the District Council, it is provided that, in the laying or relaying of mains and pipes, other than service-pipes, below the surface of the roadway of any street or bridge, they shall be placed so that not less than 2 ft. 6 in. shall intervene between the surface of the roadway and the upper surface of the mains or pipes. It will be remembered that the Company desired that section 46 of the Act of 1869—referring to the charge for public lighting—should be amended by the insertion of the words "for lighting purposes" after "consumer." Instead of this amendment, a clause has been inserted providing that, for purposes of public lighting, the price of gas supplied to the District Council shall be not less than 8 per cent. below the net price charged to ordinary consumers for lighting purposes, and 2 per cent. below the net price charged to any other consumer for lighting purposes; and for power purposes it is not to exceed the lowest price for the time being charged by the Company to any consumer for power purposes. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The next Act is that of the Colchester Gas Company. The first change noted is that in the residuals clause accompanying the new works powers, the one-third purchasing restriction appears. Lands are scheduled; and it is enacted that the powers of compulsory purchase are to cease after the expiration of a period of three years from the date when the Treasury shall give their consent to the raising of the money requisite for the purchase, or a period of four years from the termination of the present war, whichever period shall expire the earlier. The clauses as to overhead constructions, extensions of limits of supply, and the calorific power standard (500 B.Th.U.) remain intact. In connection with the last-named change, the supply of incandescent gas-burners is provided for, as follows:

> The Company shall also, if required, at any time within the said period of two years, by any consumer of gas supplied by the Company by means of a prepayment meter, upon whose premises no incandescent burner shall have been fixed prior to the date of such requirement, supply and fix upon the premises free of charge the incandescent burner suitable in all respects for the consumption of gas of the quality prescribed by this Act, in ex-

change for such one as he may select of the flat-flame burners in use by him at such date, provided that, notwithstanding anything in this sub-section, the Company shall not be liable to supply more than one incandescent burner on any one premises.

In the pressure clause, an increase in the minimum has been provided for. The pressure of the gas supplied to any consumer is to be not less than 15-10ths at the main, or as near as may be to the junction therewith of the service-pipe supply of the consumer. Of the £90,000 additional capital asked for, the Company have been authorized to raise £54,000, of which they are allowed, if thought fit, to raise no less than £52,000 by the issue of preference stock. In connection with dividends, the Company asked for power to pay up to 7 per cent. on such part of the capital issued as preference. This has been altered to 6 per cent. Powers have been granted for the issue of redeemable preference shares or stock and debenture stock; but the Company have not been allowed to create the desired redemption fund. But redemption is provided for as in the case of the Aberdare Act. We miss the clause under which it is proposed to extinguish the capital debit balance. The standard price of gas has been reduced from the proposed 3s. 9d. to 3s. 3d. As to the price in the new limits, the intention was that it should not exceed by more than 9d. the charge in the borough. Now it is provided that, within a specified part of the parish of Stanway, the prices are not to exceed those for the time being charged to consumers, under like circumstances, within the borough. In the parish of East Donyland, the prices are not to exceed by more than 6d. those charged to consumers in the borough under like circumstances. Within the remainder of the new limits, the excess charge is not to be more than 9d. The Company sought to amend the public lighting clause by the insertion of the words "for gas supplied for lighting purposes only." But a new clause giving the Corporation fresh terms has been included. Henceforth, the price to be charged for gas supplied to the public lamps is to be less by the amounts stipulated below than the lowest price for the time being charged by the Company for gas supplied by them within the borough for lighting purposes only to persons (other than Government Departments) who shall burn the same by meter other than a prepayment meter. That is to say, in any year in which the total amount of gas supplied to the Corporation shall exceed 5 million cubic feet, and shall not exceed 9 million cubic feet, the reduction is to be 3d. per 1000 cubic feet; and, in any year in which the total amount of gas supplied exceeds 9 million cubic feet, by 6d. per 1000 cubic feet. Most of the other clauses are common to present-day gas legislation, or are as noticed when reviewing the Bill. In a set of clauses for the protection of the Colchester Corporation, it is provided that any new mains or pipes shall, if possible, be laid or constructed at such a depth that not less than 2 feet in the case of cast-iron pipes and 1 ft. 6 in. in the case of steel pipes shall intervene between the surface of the carriage way and the upper surface of the mains. In protecting provisions for the Essex County Council, it has been agreed that the Council may require that all mains and pipes shall, wherever practicable, be laid in or at the side of the road; and, if any main or pipe is laid below the surface of the carriage way of any main road at a depth of less than 2 feet, the Council shall not be liable for any damage caused to the main or pipe by the use of any steam or other roller or of any traction engine belonging to the Council, provided such roller or engine does not exceed 12 tons in weight. A clause appears in favour of the Lexden and Winstree Rural District Council, providing that if, after the expiration of five years from the termination of the present war, the Company have not laid down mains for the purpose of affording a supply of gas in any of the parishes included in the rural district, and shall not extend their mains within twelve calendar months after written notice from the Lexden Council requiring them to do so, the Act is not to prevent any other company, person, or local authority obtaining statutory powers of supply. A similar clause appears, in favour of the Tendring Rural District Council, in reference to the parishes of Ardleigh, Great Bromley, and part of Elmstead. [*Parliamentary Agents: Messrs. Rees and Freres.*]

There does not appear to have been much alteration in the measure promoted by the Ferndale Gas Company. The additional capital authorized is, as requested, £25,750; but the share capital authorized by the Order of 1883 and this Act is not to exceed on the whole the sum of £47,010 [the Bill said £45,750]. No other charges are noted until the provision as to a capital redemption fund is reached; and this has undergone some change. It now reads—

In any year after the year 1915, in which the divisible profits of the Company shall exceed the amount required to pay the dividends on the preference capital, the Company shall transfer to a fund, to be called "the capital redemption fund," the balance of such divisible profits remaining, after paying the said dividend, up to the sum of £200 per annum. Provided that, as soon as the Company have transferred to the fund sums amounting in the aggregate to £3800, this sub-section shall cease to operate and have effect. Every sum so transferred shall be applied by the Company, as soon as reasonably possible, to the purchase of ordinary or preference shares or stock in the capital of the Company.

The extension that the Company proposed to the Treasury capital restriction clause has not been allowed. The calorific standard clause and other provisions are as when we noticed the Bill. The minimum pressure of gas, as from Jan. 1 next year, is to be not less than 1 inch. The maximum price of gas has been lowered from 6s. 10d. to 5s. [*Parliamentary Agents: Messrs. Lees and Co.*]

By their Act, the Folkestone Gas Company have secured powers for the transfer to them of the Hythe Gas Company's undertaking, on the terms mentioned when reviewing the Bill on Jan. 11. The capital conversion scheme as then described has been passed. The provision as to continuing in force the unexercised capital powers of the Act of 1898 has been modified by eliminating the date (July 1 next) up to which the powers were to be exercisable, and by deleting mention of a dividend of 7 per cent. But in a succeeding section, the prescribed dividends are now all set out: On the preference stock, the dividend is not to exceed 6 per cent. per annum; on the ordinary shares representing the capital authorized by the Act of 1865, including the converted loan capital raised under that Act, it is to be at the rate of 10 per cent. per annum; on the ordinary shares representing the converted loan capital raised under the Act of 1876, at the rate of 5 per cent. per annum; on the ordinary shares, at the rate of 7 per cent. per annum; and on the ordinary stock at the rate of 5 per cent.—these dividends being subject to the sliding-scale provisions. The Treasury clause is in the ordinary form, and does not include the exemptions referred to when dealing with the Bill. The clauses as to borrowing powers, new limits of supply, and the acquisition of the rights under the East Kent Gas Order, 1914, and the Elham Valley Order of 1912, are as mentioned in the review of the Bill. The proposed standard price has been reduced from 3s. 6d. to 3s. 4d., with a neutral zone between the latter figure and 3s. 9d.; but provision is made for revision through the Board of Trade (after hearing all parties) at any time prior to the expiration of five years from the termination of the war. The standard calorific value is altered from 500 to 540 B.Th.U.; but the penalty line starts at 500 B.Th.U. The Company are to continue to maintain a photometer for the testing of the illuminating power of the gas; but they are not to be liable to forfeitures. The minimum pressure at which gas is to be supplied to any consumer is to be not less than, from sunset to 10 p.m., 2 inches; and, at all other times, 12-10ths of an inch. The residuals clause has been inserted, with the one-third restriction. In clauses for the protection of the Folkestone Corporation, exemption is given for liability for damage to mains, pipes, or other works of the Company by steam-roller, scarifier, or other similar appliance, provided the net weight does not exceed 12 tons. The same clause has been given to the District Councils of Sandgate and Cheriton. A curious section is one providing that the Folkestone Company, so long as they are the owners of the premises occupied by the Hythe Gas-Works, shall continue to pay rates at the same level as if the works were continued thereon with the same productive capacity as at the passing of the Act. [*Parliamentary Agents: Messrs. Rees and Freres.*]

ELECTRICITY SUPPLY MEMORANDA.

Collaboration, and the Dictators of Terms.

As expected, the little kite that the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter, D.Sc.) sent up at the meeting of the proprietors the other week, regarding the respective spheres and relations of the gas and electricity supply industries, has been looked at smilingly by the other side, and rejected as not being at all of the character that will take their fancy. Notwithstanding their destructive use of coal, and of all the value that it contains other than its steam-raising power, the conceit of some of our electrical friends is such that they think it is for them to name the conditions on which they are prepared to discuss any question of collaboration of the two industries. "In any case," says "Meteor," of the "Electrical Times," "the lines upon which the Chairman of the South Metropolitan Gas Company would consent to discuss collaboration are extremely far from suiting our convenience." We are not sure that the superior powers will always be prepared to consider any industry's "convenience" when the nation's economic interests claim prior right to be heard and to be legislated for. But with bombast that could only be equalled by the German Military High Command, when sending messages to neutral countries and to the people at home who have an uncomfortable feeling that all is not so well as they could hope for, "Meteor" shouts, "We stand in sight of complete victory." But the strange thing is that, though in this happy condition, "Meteor" is conscious that the gas industry will require a good deal more crushing yet before it will consent to discuss "peace terms" of the nature that will suit the "convenience" of the electricity supply industry. "Whilst human nature remains what it is, nothing short of imminent bankruptcy," remarks the short-sighted electrical philosopher, "is likely to force our gas competitors into really negotiatory attitude. They are not in a giving mood to-day; it is a matter of time." Certainly. The electrical industry finds it a slow and wearisome process to bring to its knees an industry that goes on from strength to strength, the strides in which have been particularly marked during the war.

The Fuel Suppliers of the Future.

However, the appearance of "imminent bankruptcy" is obviously, in the erratic mind of "Meteor," something which it is safer to consider belongs to the remote future, because, earlier in his comments, he concedes "that a fair amount of gas will, perhaps, always be required for certain

industrial processes." But, on the other hand, the Chairman of the South Metropolitan Gas Company, who is in the position to take a view from a higher altitude than "Meteor," has no room for doubt that gas undertakings will be the fuel suppliers of the future—not only gaseous, but solid. There can be but little questioning of this by anyone in the position to make survey of present and prospective requirements outside his own industry, and who can read the certain part that the gas industry is called upon to take in the developments that are presenting themselves to view with more insistence day by day. The old jealousy and spitefulness again jut out of "Meteor's" remarks by the application of slander and hard names. He says: "The electrical engineer is not prepared to admit that domestic consumers are best supplied with a dangerous 'poison' and explosive by way of fuel." Since the campaign of frightfulness by which the British electrical industry at one time sought to improve its business, and to depreciate that of the gas industry, the heating business—both domestic and industrial—has continued to expand majestically. And the extravagant words of an electrical journalist will do as little harm on the public mind as water does on a duck's back. By the way, speaking of water, this must also be a "poison" according to the learned "Meteor's" way of thinking; seeing that it will suffocate if one chooses to wholly immerse one's self in it long enough, and so, too, would an atmosphere of oxygen or any other gas. The country and consumers are best served with a "fuel" that does not show the same thermal inefficiency that electricity does in relation to the thermal value of the fuel employed to generate it. The electrical engineer, too, we read will not be "particularly pleased to burn coke breeze." "This proposal has painful resemblance to giving a dog a dry bone after everybody else has done with it." Drawing thus upon poor old Mother Hubbard for a simile, does not disclose any considerable knowledge of the fuel value of coke breeze on the part of the chief occupant of the editorial office of the "Electrical Times;" and he cannot be aware of the extent to which it is being employed for steam-raising to-day, nor the extent to which it was formerly employed. Besides which coke can be had in normal times if preferred to breeze. Let "Meteor" remember that 6 cubic feet of gas have a thermal value equal to a unit of electricity, that, after meeting the fuel requirements of their retort-furnaces, the gas industry makes for sale an average of 10 cwt. of coke per ton of coal used (the coke having a thermal value of approximately 13,000 B.Th.U. per lb.), and about 10 gallons of tar per ton of coal, which tar has also a thermal value, to say nothing of the other value of the constituents of the tar and of the ammoniacal liquor.

Shrinkage of Meat in Cooking.

A correspondent of the "Electrical Times"—Mr. O. A. Prosser, of Plaistow—has asked the pertinent question, "How is it that meat when cooked by electricity does not shrink so much as when cooked by coal or gas fuel?" The "Ed." of our electrical contemporary has made a reply of which he cannot be particularly proud, and which we rather fancy he would not be prepared to attempt to substantiate by a public demonstration. If he searches through the records, he will find that challenges have been issued time after time, but there has not been a single response from the electricity industry. The disinclination to public demonstration speaks volumes. The "Ed." states that the reason for the difference in the amount of shrinkage is due to the fact that, in the case of electrical operation, cooking takes place at a comparatively low temperature and in a closed chamber. Will the writer of these words tell its readers what there is to prevent cooking being done in a gas-oven at a low temperature, with the meat in a covered tin constituting a closed chamber? There is no difficulty whatever in obtaining with a gas-oven results similar to those claimed for an electric-oven. In a gas-oven, there is an elasticity that enables people to get just what they require—well cooked to "under-done" meat, or meat well-cooked with the "juices" retained. It all depends upon the *modus operandi*, and the fancy of the people who are to eat the meat. The editor also informs his correspondent that the makers of gas-cookers have admitted that with their constructions 25 to 30 per cent. of the weight of the meat is lost. But he does not give the names of these makers, or say whether they are recognized representative ones. The same statement as to percentage loss has appeared in old-fashioned cookery books almost from the advent of the gas-cooker in its original crude form; and the cookery book publishers have gone on printing the misleading statement just as though once written it applied to all time and to all circumstances. Now will the "Electrical Times" take part in a cookery demonstration to prove that the electric-oven is capable, all conditions being equal, of showing a saving in the weight of meat of at least 15 per cent. as compared with a gas-cooker of modern type?

The Multi Cooker Support.

We are surprised, after what has appeared in our columns, that the "Ed." of the "Electrical Times" should seek to find support and refuge in the specious advertisements now being widely published by certain money-making ventures which are trading on that widely spread public attribute—credulity. If the learned person who sought to inform Mr. Prosser would just consider the relation of the work done to the B.Th.U. expended, he would see how much reliance is to be placed on the advertised statements which he has ignorantly brought to his aid. He has not carefully read the "JOURNAL" recently, or he would have seen the frailty of the support. He might peruse two paragraphs that appeared on p. 59 of the "JOURNAL" for July 11, one that was published on p. 107, July 18, and an article on p. 217, Aug. 1; and then he will see how little justification there was for stating: "That the *gas people recognize* that there is serious waste of meat during cooking is shown by an advertisement that appeared in last week's papers in connection with an attachment for gas-cookers." Some further absurdity followed. The "gas people" have no interest (whatever the electrical people as represented by the "Ed." of the "Electrical Times" may think suitable for themselves) in endeavouring to trade on humbug. However, it seems utterly impossible for some electricians to introduce fair play into their writings upon and dealings with their competitor. This tells its own tale—a tale of a lack of strength. It is the German method on a smaller scale; but it is none the less contemptible.

Erratic Street Lamps.

We have always contended that reliability is an essential in street lighting, and that it is the responsibility of street-lighting authorities to adopt the form of lighting which gives the best account of itself in the matter of constancy. When there is trouble in connection with electric street-lighting, it generally means a whole district put into darkness, or all the lamps upon one circuit simultaneously put out of public service. Sometimes, too, individual lamps are strongly affected with Saint Vitus's dance. An electric-lamp suffering from convulsions of this order seems to have contributed to the death of a woman the other day near the National Gallery. She was knocked down by a motor car, and died in hospital. At the inquest two constables gave evidence as to the vagaries of the electric-lamp on a street refuge close to the spot. At one moment, it would flare-up brightly, and immediately afterwards could scarcely be seen. In returning a verdict of "Accidental death," the Jury suggested that the attention of the authorities should be drawn to the faulty standard. If the members of the Jury were observant men, they must have known that this was not an unusual case of electrical infidelity to duty, and that there are almost nightly a good many electric lamps that are similarly affected.

Another Scheme for London.

Still another electricity scheme has been proposed for the Metropolis; and it owes its birth to the Board of Trade linking-up proposals. The Borough Councils owning electric undertakings were in conference on July 21; and they then authorized the Committee of Electrical Engineers to invite a technical representative of every electrical undertaking in the Greater London area to assist in preparing as completely as possible a report on the linking-up of generating stations in the Greater London area, which is defined as a radius of twenty miles with its centre at East Ham Town Hall (including the district of Watford). All local authorities within, or whose areas are cut by, the line of the circle are invited to send two representatives, together with their town clerks and electrical engineers, to future conferences. At present, neither the companies nor the municipal authorities appear to have rushed in with their acceptances of the invitation. However, at a meeting of the Metropolitan Municipal Authorities held prior to the expansion referred to, a resolution was passed expressing the opinion that a central authority should be established, including the County Council and Borough Councils who are authorized distributors, for the purpose of dealing with the supply of electricity in London. But care, it was suggested, should be taken that no attempt was made by the central authority to hamper or restrict the economic development of any existing borough council generating station; while the County Council should sanction loans which were not any more onerous in terms than absolutely necessary. Among the duties of the proposed central body would be the supply of electricity in bulk to authorized distributors; the standardization of electricity supply in London; if the County Council purchase the undertakings of the Companies, the borough councils consider the County Council should transfer to them the distribution of electricity within their administrative areas; a deficiency rate, it is also thought, should be levied upon any borough council who do not take a supply of current under any scheme formulated by the central authority; and it is a condition that no attempt should be made by the County Council to purchase compulsorily any borough council undertaking. If the companies enter into the conference, they will see that this scheme undergoes a little reconstruction.

British Association Committee on Fuel Economy.—At a joint meeting of the Chemical and Engineering Sections, at the forthcoming Newcastle meeting of the British Association for the Advancement of Science, there will be presented and discussed an interim report by the Committee on Fuel Economy and Smoke Prevention appointed a year ago, under the chairmanship of Professor W. A. Bone. The Committee includes many well-known names; the two members most closely identified with the gas industry being Mr. Douglas H. Helps, of Reading, and Mr. H. James Yates, of Birmingham. The field of inquiry has been divided-up among five Sub-Committees, one of them appointed to deal with the carbonization of coal. Mr. E. D. Simon, of No. 20, Mount Street, Manchester, is the Hon. Secretary of the Committee.

REPORT OF THE ROAD BOARD.

THERE has just been published—signed by the Chairman, Sir George S. Gibb—the sixth annual report of the Road Board, which deals with the twelve months ended March 31. In this period, applications were made for advances amounting to £310,261, of which £297,038, or 95·73 per cent., was for the improvement of road crusts. The sum asked for was, in consequence of the war, very far below that of preceding years; the figure for 1914-15 having been £2,001,264, and that for 1913-14 £2,593,805.

In view of the necessity for conserving the resources of capital and labour, arrangements were made to postpone, either wholly or partially, the execution of many schemes of road improvement. Twelve months ago, the Retrenchment Committee appointed by the Treasury recommended that the activities of the Road Board should be suspended during the war, and that the proceeds of the taxes earmarked for the Board should be retained in the Exchequer. However, on re-consideration, the Committee withdrew their suggestion that assistance to highway authorities from the road improvement fund should be entirely discontinued, and decided that such work should be undertaken as was required in connection with improvements of road crust necessary to prevent the serious deterioration of roads of real importance.

Readers of the "JOURNAL" will re-call that, towards the end of February, after consultation with the Treasury, a circular was addressed, on behalf of the Board, to county authorities in Great Britain. In this it was stated, with regard to applications for advances towards the cost of road crust improvements to be carried out during the financial year 1916-17, that it had been agreed that new grants or loans to an aggregate sum not exceeding £200,000 might be made out of the surplus at the credit of the road improvement fund. It was pointed out that the grants and loans would be confined mainly to expenditure on tar treatment of important roads, either in the shape of surface dressing or pitch grouting or tar macadam; and no grant would be made for the use of crude tar. On the terms of this letter, the Board have proceeded with the distribution of the £200,000 referred to. Practically the whole of the money will be absorbed by the needs of the main county roads in Great Britain, which are in suitable condition for tar treatment.

The report itself is followed by a number of appendices; and in one of these Mr. H. P. Maybury (the Manager and Engineer to the Board), Mr. R. E. Crompton (the Consulting Engineer), and Mr. T. E. Stanton (on behalf of the National Physical Laboratory) report upon tests carried out upon a road-testing machine in the Road Board laboratory, at Teddington. These tests, it is said, afford valuable information. In addition to showing that the bituminous surfaces, when carefully made and laid, are likely to be durable and economical, the tests appear to throw light on several of the causes of past failures, and indicate means by which such failures may in future be avoided or minimized. A description is given of the machine employed, and of the method of carrying out the tests. The results of four sets of tests of road materials are published; and with regard to these, the report contains full particulars and observations for each test, from which, it is remarked, general conclusions can be drawn.

NOTES ON BYE-PRODUCT COKING, &c.

Low-Temperature Carbonization.

[COMMUNICATED.]

THE questions asked in Parliament recently concerning the low-temperature carbonization plant which is being erected at Barnsley on behalf of the Barnsley Smokeless Fuel Company, Limited, has revived the flagging attention of public interest to this matter. The writer has frequently referred in these columns to the extravagant statements which have from time to time been circulated concerning the possibilities of low-temperature carbonization, and warned readers not to place too much reliance in the bombastic statements which have appeared in alluring prospectuses at the instance of company promoters.

Much of the misguided enthusiasm has been created by the attitude of some of the motoring papers, which, with no questionable motive, have repeatedly boomed the possibility and advisability of home produced motor spirit. With this object one has no quarrel whatsoever, and nothing would appear better than to see the whole of the motor spirit consumed in this country become a home product. But this end is not going to be achieved by misleading the public and by forming companies to work processes which are both economically and scientifically unsound. When replying to the question *re* the Barnsley Company, Dr. Addison stated that the Government had fulfilled all the obligations they undertook, and that the failure was on the part of the Company. At the same time, he added, as if by way of further excuse, that the coke was unsuitable for metallurgical purposes, and that hence, from the munitions point of view, the value of the plant was gone. Now this is distinctly unsatisfactory from every point of view. Surely it did not need the expenditure of £10,000 of public money to discover this fact! If that is the price of the scientific advice on matters of this kind, there is no wonder that coke-oven managers and such like complain of the attitude of the Ministry of Munitions towards the industry in general. Anyone at all familiar with the carbonization of coal could have given the information at a much less price, and with equal certainty and satisfaction. But, apart from this, it was always understood that the great value of the work from the munitions point of view was that enormous yields of bye-products were obtained by this method. What has become of the benzol, toluol, &c., which were to make the process so valuable? Is one to take it as a gentle hint from the department that further experiment has after all proved that the yields are not what was originally anticipated? It is a distinct rebuff for the promoters of the low-temperature process, and some further explanation ought to be forthcoming.

There are many other features of low temperature carbonization which are open to serious argument. One of its strongest supporters is Professor Armstrong; but in many cases his arguments are so extreme as to be almost ludicrous. He, in common with several others, loses sight of many of the outstanding practical difficulties when they talk of abolishing the use of raw coal by compulsory legislation. They talk as if it could be done in five minutes; whereas actually any conversion, if it comes, must necessarily be the natural evolution of many years. In the first instance, as already pointed out, we have not yet reached the stage of having a satisfactory system to adopt; and until we have an efficient substitute for anything, it is futile to talk of compulsory abolition of it. Again, it is all very well to talk of the hygienic advantages of a smokeless fuel, and thus a smokeless atmosphere. At the present day, the majority of people do not consider hygiene when they buy household coal—they consider the fire; and it is useless to expect any substantial progress towards the universal use of smokeless fuel until a fuel is provided at a price equal to, or less than, that of coal reckoned by the ordinary householder's standard of efficiency. When we get that we can hope to see low temperature plants being erected, but not before.

THE DECLINE OF THE BEE-HIVE OVEN.

When the next annual return of the Home Office concerning the operation of coke-ovens is issued, it will undoubtedly show a most remarkable and exceptional decrease in the number of non-bye-product recovery ovens in operation in this country. Although there has been no actual compulsion in the matter of closing-down bee-hive ovens, in almost every district in the country, and particularly in Durham and Yorkshire, most of the large collieries have closed-down a good number of, if not all, their bee-hive ovens. The reason for this appears to have been twofold.

Firstly, on account of enlistment, the output at all the pits has decreased enormously; and there has not been nearly enough slack to keep the ovens fully supplied. Now, most of the collieries have bee-hive and bye-product ovens, and have worked both. It is far easier and cheaper to shut-down bee-hive ovens than to stop bye-product ovens—partly on account of the brickwork, and also because of the large amount of capital involved—so that when the coal scarcity has arisen, the bee-hive ovens have had to suffer first. This, of course, is as it should be, because it is essential that the whole of the bye-product ovens should be kept going to the full.

Secondly, the fixing of a maximum price for coke has had some effect, though not to the extent that many people imagine. Bee-hive coke has always brought a higher price than bye-product coke; and when the maximum prices were fixed, some of the bee-hive producers could not carry on at a profit. At the same time, some bee-hive coke is used for special purposes, such as foundry work and crucible steel smelting, and until we get a satisfactory substitute there will be a little bee-hive coking carried on. We shall probably find that the returns for 1916 indicate that at least 80 per cent. of the coke production was obtained from bye-product ovens.

Sir Corbet Woodall's Estate.—The late Sir Corbet Woodall left estate of the gross value of £97,442; the net personalty being £86,679. All the property is put in trust to pay the income to the testator's wife during widowhood.

Shortage of Coal in Denmark.—It is, according to the "Iron and Coal Trades Review," reported from Copenhagen that the scarcity of coal in Denmark is now felt seriously throughout the country, and that the representatives of the town councils are requesting the Government to communicate with the British Government, with a view to obtaining sufficient coal to enable the supply of gas to be maintained.

A Board of Trade Deputation on the Coal Question.—The announcement is made that Mr. Runciman has promised to receive, some time before the re-assembling of Parliament (next Tuesday, we understand, is the date fixed) a deputation from municipal gas and similar undertakings, who desire to protest against the South Wales coalowners being allowed to raise the pit-head price of coal 2s. 6d. per ton, and against any further allowances of a like nature being agreed to.

Coke Production in the United States.—A table compiled by the United States Geological Survey shows that the coke production of the country has now increased to many times the tonnage of 1880, and that the percentage of yield from the coal has gone up almost 4 points. In 1880, the coal used in 12,372 ovens was 5,237,741 tons; the production of coke being 3,338,300 tons. The number of ovens in 1914 was 99,755, using 51,623,750 tons of coal, and producing 34,555,914 tons of coke. The percentage yield of coke in the former year was 63, and in the latter 66·9.

ON THE DETERMINATION OF THE LEAKAGES IN GAS-PIPES.

By Michelangelo Boehm, Engineer, of Milan.

To test the imperviousness of gas-mains, the following methods are generally employed.

(1) When dealing with new pipes intended to distribute gas at a maximum pressure of from 100 to 150 mm. of water, air is let into the pipe, which is closed at both ends, until a head of some decimetres of water is reached. The pipe is left under pressure for a time; and the variations in pressure are observed.

This experiment is usually carried out at dusk, when the temperature tends to diminish. If the pipes are to be put under a long test, the variations in temperature and atmospheric pressure must be taken into account. By the form of the curves of pressure and temperature a judgment as to the tightness of the pipe-line may be made.

Before supplying gas-pipes contractors generally specify—independently of their diameter—the maximum loss admissible per 100 litres per km.-hour of pipe when charged with gas at an average pressure of 50 mm. of water. The loss in the pipes is then practically measured, by agreement, by a test meter, by a delivery regulator, or else by a gasholder. While pipes are being laid, some contractors arrange to carry out daily a rough test of the leakage, based on the proceeding and calculation described below, which are by no means rigorous.

After admitting air into the pipe at the pressure of 1 metre of water, the decrease in pressure which occurs in a space of ten minutes is observed. Then, if D is the difference, in mm. of water, between the initial and the final heads at the end of 10 minutes, V, the volume of the pipe in litres, and, K, its length in km., the loss per km.-hour of piping expressed in litres when the pipe is full of gas at a pressure of 50 mm. and of density 0·43 (air = 1) is given by

$$\frac{D\,V}{4888\,K}$$

This formula is deduced from a very simple calculation (into which assumptions are introduced) which on the whole may be accepted, because they tend to give a result higher than the correct one.

(2) In the case of a distributing network of pipes in use, the method of direct measurement may be applied as giving fairly good results. All the cocks of the gas-meters and the street lamps being turned off, as well as the inlet-valve of the station governor, the bell of the latter is loaded with weights corresponding to a pressure of from 30 to 35 mm. As soon as the bye-pass valve is opened, the gasholder bell will assume its upper position, and the pressure in the pipes will be equal to the pressure in the gasholder. Having once again turned off the valve, one notes the instant when the bell begins its downward course, and the volume swept through from the beginning to the end of its travel gives the loss of the piping in the corresponding time.

It is obvious that the same result can be obtained by using a small portable gasholder, or a meter connected to the holder on one side and to the distributing system on the other. If the pressures found are very nearly atmospheric, the losses thus determined correspond closely to those that would be found with piping actually in use, although the conditions in both cases differ somewhat.

Strictly speaking, during the test, the gas in the pipes finds itself in nearly statical conditions, and its inherent pressure—disregarding the changes of level—may be taken as constant from one extremity to the other. But, generally speaking, in the case of the gas flowing, pressure oscillations have but a secondary influence on the variation of the losses.

The same method is adopted by Bouvier for measuring the relative losses of various sections of a distributing system that is for a time isolated by means of dividing syphons. The isolated section is connected to a portable gasholder of (say) 300 litres capacity, loaded in such a way as to produce a pressure of 100 mm. Then all one has to measure is the travel of the gasholder bell in a given time.

When it is required to determine the losses on pipes containing gas in a state of flow, and its velocity is considerable, and therefore such that its pressure at both ends differs considerably, the above methods are not applicable.

In the case of a single main without branches, to obtain accurate results, direct measurement of the gas entering the system and that which reaches the other end could be carried out. This operation, however, is complicated, and presents considerable practical difficulties, especially if the main piping subdivides into several branches. The problem is of great importance in the cases of long feeders joining the gasholders to the generating plant, or in the case of urban distributing feeders that are in continuous use or only during the time of greatest consumption. In such cases the methods to be discussed in the present "note" may find some application.

General Case.

Let us suppose we have a pipe-line closed at both ends and containing gas under pressure in a state of rest. Owing to the imperfect condition of the pipe joints the initial pressure P will gradually decrease. The rate of decrease will evidently depend on the value of P and the condition of the joints. The curve

$$P = f(t) \quad . \quad . \quad . \quad . \quad (1)$$

where t is the time and P the pressure, may be obtained by means of a pressure indicator. Assuming the gas at rest to be sealed in a pipe of volume V and subject to the absolute pressure p by Boyle's law (*),

$$p\,v = \text{constant}$$

and the volume dV of gas lost, owing to a variation of pressure, will be:

$$dV = -V\frac{dp}{p}$$

This is the volume measured under the pressure p. At the atmospheric pressure p_o, we must have:

$$dV_o = -V\frac{dp}{p_0}$$

The variation of pressure dp will take place in the infinitesimal time dt; and therefore the loss on the unit of time is:

$$\frac{dV_o}{dt} = -\frac{V}{p_o}\frac{dp}{dt}$$

But

$$\frac{dp}{d} = \frac{dP}{dt} = f^1(t)$$

And hence if $f^1(t)$ is the value the derived curve (t) of the pressure diagram assumes for a given value of P, the volume of gas measured at the pressure p_o, lost in the unit of time in the pipe of volume V, subject to the pressure P, is expressed by:

$$-\frac{V}{p_o}f^1(t) \quad . \quad . \quad . \quad . \quad (2)$$

This formula gives a basis for judging as to the degree of imperviousness of a pipe, or rather to compare the results of different tests on the imperviousness of a feeder-main on the various sections of the same feeder; but it cannot be used for actually measuring the leakage of the feeder-main while in use.

Let us consider the case of a pipe system made up of more than one successive branch of different diameter and length, and in which the gas is in a state of flow. To any given point along the tubing corresponds a definite pressure. Taking one line of piping of constant section s having no notable local dispersion or obstacles of any kind—such as contractions, obstructions, &c., we have:

$$P = \phi(l) \quad . \quad . \quad . \quad . \quad (3)$$

where $\phi(l)$ is a finite and continuous function of the distance from the starting point holding good for the whole length of piping in question of uniform porosity.

As to the form of $\phi(l)$, we note that neglecting the effect of changes of level (3) represents a curve rising convex to the l-axis, and tending to approach more and more the straight line joining the two extreme values of P at the ends of the piping the smaller the losses are. In any case, $\phi(l)$ may be obtained, and therefore may be considered as known.

As to the effects of the losses, the length of piping may be considered as made up of a series of infinitely short elements, each containing gas in a state of rest, and at a pressure which varies with the distance from the starting point, according to (3).

The loss due to an element of length dl in the unit of time will, therefore, equal the loss due to the whole length of pipes, subject to the same pressure $\times \frac{dl}{L}$. And hence from (2)

$$-\frac{dl}{L}\frac{V}{p_o}f^1(t) = -\frac{s}{p_o}dl\,f^1(t) \quad . \quad . \quad . \quad . \quad (4)$$

But $f^1(t)$ is a function of t which by (3) may be expressed as a function of l. We shall have:

$$f^1(t) = \phi(l)$$

And hence the total leakage of gas flowing in the whole piping of length L in the unit of time will be:

$$q = -\frac{s}{p_o}\int_0^L \phi(l)\,dl \quad . \quad . \quad . \quad . \quad (5)$$

The pressure diagram that gives $P = f(t)$ was obtained while the piping was full of gas. The values of $P = \phi(l)$ must likewise be obtained when the piping of given length is working regularly. When the diagram is to be obtained under atmospheric air, in order to calculate the leakage of the piping carrying the flowing gas, it is evident we must take into account the difference in the specific gravity of the two fluids.

This problem can be solved graphically in a fairly simple manner. In fig. 1, let OP and Ot be the axes of the pressures and times respectively; let ABC be the diagram of the effective pressures; $P = f(t)$ included between the pressures; P_1 and P_2 at both ends of the piping of constant section s. If the length OL represents (to scale) the total length of the piping, ADC will be the curve giving the pressures along it, and its ordinates are given to the pressure scale by:

$$P = \phi(l)$$

(*) $p = P + p_o$

where p_o is the atmospheric pressure.

N.B.—It is assumed that the gas is under constant pressure all along the piping—*i.e.*, all changes of level may be neglected.

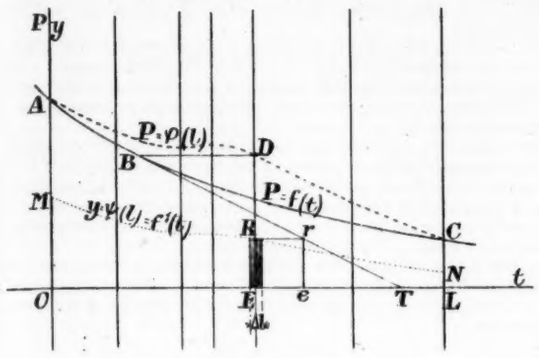

Fig. 1.

Let us now consider a system of piping. Let it be so short that we may take it to be subject to the constant pressure:

$$P_m = DE$$

The leakage of the whole piping at the pressure P_m is proportional to the value (for $P = P_m$) taken from $f^1(t)$. But since BD is parallel to Ot, $f^1(t)$ will be the tangent of the angle BTO made by the tangent at B to the curve $P = f(t)$ with the axis itself and putting $Te = 1$

$$er = ER = f^1(t)$$

From (4) it is clear that the loss due to the element $dl = \frac{s}{p_o} dl\, f^1(t)$ is represented by the product of shaded area in the diagram $\frac{s}{p_o}$.

The locus of the points R, which is known at once from $P = f(t)$ and $P = \phi(l)$, gives the curve MRN represented by $\gamma = \phi(l)$. The loss in the whole piping due to the gas flowing is given, therefore, by the product of the $f^1(t)$ curve thus obtained by s/p^o.

Consideration of a Particular Case.

The gasholder of 12,000 cubic metres capacity at Ucciardone di Palermo is supplied from the gas-works of St. Erasmus by pipes of 175 mm. diameter and 4000 m. long. The pressure of the gasholder varies from 130 to 275 mm. The difference of level between the works and the gasholder is negligible. To send 1000 cubic metres of gas per hour into the gasholder it must be compressed to a head of about 2200 mm. of water.

To determine the quantity of gas lost during its passage through the main, I proceeded thus: I turned off the gasholder inlet valve, set going the compressor, and stopped it as soon as the gas in the pipes was a little above 2200 mm. I then closed the compressor delivery valve, and registered the pressure until it was below the average value of $P_9 = 200$ mm. It is needless to add that both valves were in perfect condition.

Fig. 2 represents the pressure diagram as taken from a graphical indicator fitted with gearing so as to increase the speed of rotation of the cylinder.

In fig. 3 the curve ABC represents $P = f(t)$ [pressure scale, 1 cm. = 200 kg. per square metre; time scale, 1 cm. = 2·04[1]]. Assuming, for simplicity's sake, that during the test of the pipes the pressure varies in a linear manner from one end to the other, $P = \phi(l)$ will be represented by the straight line AC (1 cm. of the ordinates = 200 kg. per square metre as before; 1 cm. of the abscissæ = 210 mm.). Let us divide the length of the pipes into eight parts, and determine the values of $f^1(t)$ corresponding to the points 0, 1, 2, . . . L. Thus we get the curve MRN, representing $\gamma = \phi(l)$ [scale 1 cm. = 20 kg. per m^3 per minute; the ordinate scale is determined by choosing a length that represents OM giving the ratio $\frac{OA}{OV}$; being OA read on the pressure scale and OV on the time scale]. The area under the diagram may be found by any graphical method or by Simpson's rule. The curve shows the integration curve obtained by constructing the polygonal Osss, the radii of which are parallel to the sectors projecting from U the middle lines of the diagram divisions.

Taking the scales into account, the area under the diagram, its average ordinate being OT = 3·7, is given by

$$3{\cdot}7 \times 20 \times 4000 = 296{,}000$$

Hence the leakage of the pipes per hour will be

$$q = 60 \frac{s}{p_o} \Sigma\, dl\, \phi(l)$$

$$= 60 \times \frac{0{\cdot}024}{10{,}330} 296{,}000 = 41{,}260\ m^3$$

This loss, corresponding to about 4 per cent. of the amount of gas to be driven 4 km. distant, compared to the loss occurring in ordinary distributing systems is not excessive. It can, however, be diminished by proper examination and repairs.

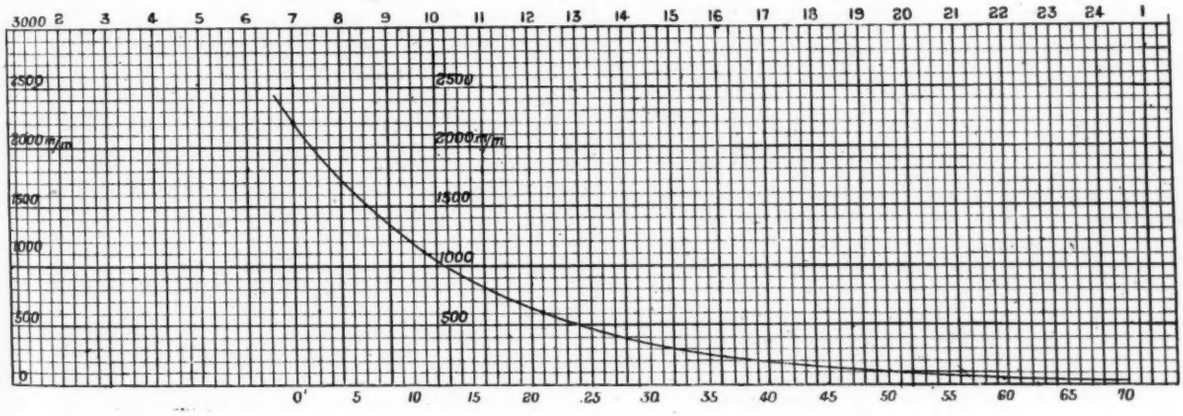

Fig. 2.

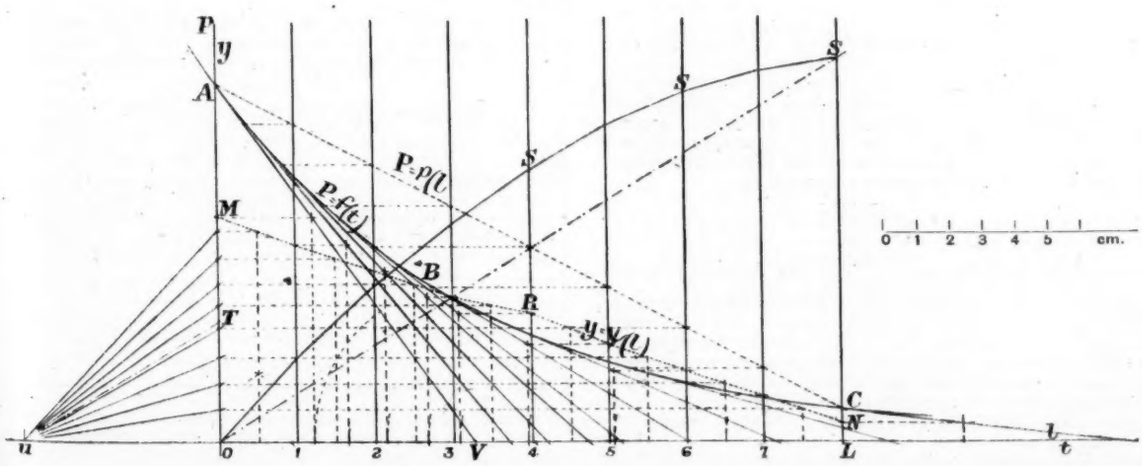

Fig. 3.

In this particular case, given the law $P = f(t)$, the result can also be obtained analytically. As a matter of fact, if we examine the values of the ordinates of the curve at equidistant points on the t-axis, we find the ratio of two consecutive ones to be very nearly constant, as will also be seen from the following table:

t	P	$\frac{P_n}{P_{n+1}}$	t	P	$\frac{P_n}{P_{n+1}}$
0	2200		20	635	
		1·13..			1·13..
2	1950		22	565	
		1·13..			1·13..
4	1725		24	500	
		1·13..			1 13..
6	1530		26	440	
					1·13..
..	..	..	28	390	
..	..	..	..	..	..
					..
14	925		34	265	
		1·13..			1·13..
16	815		36	235	
		1·13..			1·13..
18	720		38	208	
		1·13..			1·13..
20	635		40	185	

In the limiting case, we can say the curve satisfies the relation:

$$\frac{P - dP}{P} = \alpha\, dt$$

where P is the difference between the absolute pressure p and the atmospheric pressure p_0, α is a constant. Integrating, we have

$$\log_e P = A - Ct \quad . \quad . \quad . \quad . \quad (6)$$

where log. P is the hyperbolic logarithm of the pressure value given by the pressure gauge; and A and C are constants which can be determined if two points on the curve are known.

Expressed by the common logarithms (6) becomes

$$2{\cdot}3025 \log. P = A_1 - C_1 t$$

and from fig. 2 since for

$t = 0$ $\quad P_1 = 2200$ kg. per m^2
and $t = 21$ $\quad P = 600$ „

the above equation becomes

$$\log. P = 3{\cdot}3424 - 0{\cdot}02686\, t$$

which represents the curve of the diagram.

But from (6)

$$\frac{dP}{dt} = f^1(t) = - CP$$
$$= - 2{\cdot}3025\, C_1 P = - 0{\cdot}06184\, P.$$

If L is the length of the pipe, 4000 m., neglecting all differences of level, and assuming all losses due to external resistances to be uniformly distributed all along the course, the value of P at distance l metres from the source will be, as above stated

$$P = \phi(l) = P_1 - \frac{P_1 - P_2}{L} l$$

and therefore (5) becomes

$$q = \frac{sC}{p_0} \int_0^L \left(P_1 - \frac{P_1 - P_2}{L} l \right) dl$$

and putting the volume of the pipes $sL = V$

$$q = \frac{CV}{p_0} \left(\frac{P_1 + P_2}{2} \right) \quad . \quad . \quad . \quad . \quad (7)$$

Substituting the corresponding values and V = 96 m.³ the leakage per hour is

$$q = 60 \times \frac{0{\cdot}06184}{10{,}330} \times 96 \times \frac{2200 + 200}{2} = 41{,}356 \text{ m}^3.$$

There seems to be no limit to the degree of imperviousness of gas piping intended to carry high-pressure gas. Mr. Sautter, in dealing with gas distribution under high pressure, mentions a note by Professor Unwin published in the "JOURNAL OF GAS LIGHTING," in which some relative values of losses are cited. The professor takes the loss to be proportional to the products:

$$d \sqrt{\frac{P_1 + P_2}{2}}$$

where d is the diameter and $\frac{P_1 + P_2}{2}$ is the effective pressure of the piping. If this expression were exact, the leakage of the pipe system would be proportional to the square root of the pressure.

In the "JOURNAL," too, Mr. G. C. Trewby, referring to the Beckton Gas-Works, which are known to send gas to London at a pressure of 600 mm., does not consider serious the losses which would occur should it be required to raise the pressure to 1200 mm. because (Mr. Trewby argues) the losses in these high-pressure gas-mains do not exceed the losses at other British works. It cannot be denied that leakage in high-pressure gas-mains can be easily detected, and therefore repaired; and it may happen that the percentage loss compared with the amount of gas conveyed is very small, although the absolute value of the leakage may not be negligible.

We may conclude that in practice the increased leakage is not an obstacle to the extension of high-pressure gas supply. The assumption, however, that the losses are proportional to the square root of the average pressure in the piping cannot be considered as strictly accurate.

For values of p not much above atmospheric pressure, the discharge through the total section of all the leaks in the pipe is for any section practically $\alpha \sqrt{P}$. But by increasing the internal pressure, it is clear that the number of leaks increases through which dispersion may take place; and the loss in the unit of time will manifestly increase at a much higher rate.

Taking, as an example, the pipe in question, we can see from (7) that the losses increase in a linear function of the average pressure. The discharge per hour of the same tubing in cubic metres is given by

$$\frac{0{\cdot}707}{0{\cdot}98} \sqrt{\frac{p_m p d^5}{p_2 \delta_2 L}} \quad * \quad . \quad . \quad . \quad (8)$$

where p_m is the average absolute pressure in the piping in kgm.².
p_2 the absolute pressure at the end of the piping in kgm.².
$p = p_1 - p_2$ the difference between the absolute pressures at both ends.
d the diameter of the tubing in cm. = 17·5.
L the length of the tubing in metres = 4000.
δ_2 the specific density of the gas referred to air (in this case = 0·45).

Substituting the values, we have:

$$Q + q = 0{\cdot}213 \sqrt{p_m p}$$

On the other hand, we have for the loss per hour:

$$q = \frac{60 \times 0{\cdot}06184}{10{,}330} \times 96 (p_m - p_0)$$
$$= 0{\cdot}03448\, p_m - 356{,}198$$

Assuming different values of P_1 and taking, as before, P_e = 200 mm., we get for the discharge and the losses of the piping the following values:

P mm.	$\frac{P_1 + P_2}{2}$	p_m	$p = p_1 - p_2$.	Q + q m³ — hour.	q m³ hour.	$\frac{1{\cdot}0\, q}{q + Q}$.
2200	1200	11,530	2000	1022	41,356	4·04
2000	1150	11,430	1800	967	37,908	3·92
1500	850	11,180	1300	813	29,288	3·60
1000	600	10,930	800	630	20,668	3·28
614	406	10,737	414	449	14,013	3·12
500	350	10,680	300	382	12,048	3·15
400	300	10,630	200	312	10,324	3·30
300	250	10,580	100	219	8,600	3·92
250	225	10,555	50	154	7,738	5·02

It is interesting to investigate with a view to finding which initial pressure results in the smallest percentage loss in terms of the amount of gas originally sent into the pipes. For this purpose, all we have to do is to determine for which value of p_m the ratio $\frac{q}{Q + q}$ becomes a minimum—*i.e.*, the value for which

$$\frac{d\left(\frac{q}{Q+q}\right)}{d\, p_m} = 0$$

Solving, we find

$$p_m = \frac{356{,}198 - 10{,}530}{2{,}356{,}198 - 0{\cdot}03448 \times 10{,}530} = 10{,}737 \text{ mm.}$$
or $P_1 = 614$ mm.

For the initial pressure of 614 mm. sufficient to convey into the gasholder 435 cubic metres of gas per hour, the piping under consideration would therefore give a minimum relative loss of 3·12 per cent.

For practical reasons, one cannot avail oneself always of the most advantageous rate of discharge. This condition, however, must not be neglected when the costs of gas production are high.

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* This expression is deduced from the Jäger formula:

$$Q_2 = 0{\cdot}707 \sqrt{\frac{p_m p d^5}{p_2 \delta_2 L}}$$

that was previously used for the determination of the diameter of the piping = 175 mm. Q_2 represents the discharge p s of the tubing which does not distribute gas along the route. But if to n equidistant branches of equal discharge q m^3 ph are supplied altogether the loss of head h corresponds to the head due to conveying $(Q + q)$ $\sqrt{N}$ m^3 where we know

$$\sqrt{N} = \sqrt{1 - \frac{q}{Q} + \left(\tfrac{1}{3} + \tfrac{1}{2n}\right)\left(\frac{q}{Q}\right)^2}$$

If n is very large and $\frac{q}{Q} = 0{\cdot}03 \div 0{\cdot}05$ as in the practical case we have $\sqrt{N} = 0{\cdot}98$ which is the coefficient we find in (8).

The Council of the newly-constituted Association of British Chemical Manufacturers have appointed as General Secretary Sir Charles H. Radford. The business of the Association is temporarily being carried on at the offices of the Society of Chemical Industry, Broadway Chambers, Westminster.

SIXTY YEARS AGO.

From the "Journal" for August, 1856.

London Gas Charges.—We have hitherto refrained from giving publicity to a rumour which has been for some time current, relative to the Great Central Company and its future course, so long as any doubt remained over the authenticity of the rumour. But the matter has recently become one of such notoriety in the Metropolitan gas circles, that we cannot be charged with indiscretion in now referring to it. Many of our readers will recollect that in the report submitted to the general meeting of the shareholders of that Company, held on April 30, 1852, mention was made of a new arrangement entered into with the contractor, by which he was ultimately to be paid an additional halfpenny per 1000 cubic feet of gas supplied, for every additional candle of illuminating power above the original standard of 9½ candles. . . . The new contract is, we presume, in writing, and will speak for itself in due time; but we believe Mr. Croll interprets it in such a way as to give him a claim upon the Company for the immediate payment of the large sum of £20,000 for arrears up to the present time, and that proceedings have been threatened to enforce a settlement of this claim. Whether the agreement justifies such a demand, we must leave the parties to it to determine, as well as to arrange between themselves who is ultimately to bear the loss of supplying the citizens of London with gas at 4s. per 1000 cubic feet, till the mistakes of 1849 and 1850 can be rectified, and a remunerating price established. Experience has now proved, beyond the possibility of contradiction, that the price must be raised in the City of London at an early period; and the position of the Great Central Company itself will powerfully aid the settlement of the question.

Accident to a Gasholder.—An accident of a somewhat novel character happened recently to a gasholder, 70 feet in diameter, which had been for some time in use at the Boston Gas-Works. The bottom ring had got out of a true circle; and it was proposed to remedy this defect by raising the gasholder above the surface of the water in the tank, and inserting some tie-rods. To carry out this intention, the gasholder was filled with air, and when it would rise no higher, long levers were inserted under it; and, by using the edge of the tank as a fulcrum, it was hoped it might be raised out of the water. The workmen employed neglected, however, to open the manhole; and, as force was applied to the levers, the gasholder collapsed and fell over. But it is stated that the damage is not so serious as might have been expected, and that it is capable of being repaired.

THERMAL PROBLEMS FOR GAS ENGINEERS.

VII.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Heat Absorbed by the Formation of Blue Water Gas.

The ideal aimed at in the manufacture of blue water gas is a mixture of equal parts by bulk of hydrogen and carbon monoxide, as indicated by the formula: (1) $H_2O + C = H_2 + CO$. In practice, such a result can be obtained to the extent of about 95 per cent.; the remainder consisting of carbon dioxide, probably formed by the reaction: (2) $2H_2O + C = 2H_2 + CO_2$. An excess of steam, or a reduced temperature in the generator, favour the second reaction; and a high, even temperature is necessary to ensure the best possible working results.

The first-named reaction is represented by the decomposition of 18 lbs. of water (steam) and the gasification of 12 lbs. of carbon. The steam is supplied by a boiler, and is usually admitted into the generator at a pressure of 100 lbs. per square inch; the carbon being furnished by a suitable carbonaceous fuel, such as coke or anthracite coal. The result should be a mixture composed of 2 lbs. of hydrogen and 28 lbs. of carbon monoxide, or equal parts by bulk—377·4 cubic feet of each, a total of 754·8 cubic feet, say, 750 cubic feet.

Incombustible mineral matter (ash), moisture, or other impurities in the fuel are worse than useless diluents. Ash, if present in any considerable quantity, involves frequent and prolonged stoppages and heavy labour in connection with its removal, while moisture tends to reduce the temperature, necessitating increased consumption of fuel during the "blow," besides favouring the production of carbon dioxide in the gas.

The heat absorbed by the decomposition of 18 lbs. of water at 60°, with the formation of 2 lbs. of hydrogen is 2 × 61,885 = 123,770 B.Th.U. But the water is supplied to the generator in the form of 100 lbs. pressure steam, and as such has already received, in the boiler, 1153·9 B.Th.U. per pound, or 1153·9 × 18 = 20,770 B.Th.U.; leaving 123,770 − 20,770 = 103,000 B.Th.U. to be supplied by the combustion of a portion of the fuel in the generator during the blow, or by the oxidation of carbon.

The formation of carbon monoxide is an exothermic reaction; and the heat evolved is 12 × 4421 = 53,052 B.Th.U. The net result, so far as the generator is concerned, in the formation of 750 cubic feet of gas is the absorption of 103,000 − 53,052 = 49,948 B.Th.U., equivalent to 66,591 per 1000 cubic feet of gas. Since the calorific value of hydrogen and carbon monoxide per cubic foot are equal—viz., 348 B.Th.U.—that of the mixture will be the same. The bulk of 1 lb. weight will be 25 cubic feet, and the specific gravity ·525 (air = 1).

The yield of 24 lbs. of water and 16 lbs. of carbon should be 1000 cubic feet of gas, which means a consumption of 2·4 gallons of water, and 17·8 lbs. of a 90 per cent. pure fuel. The total heat absorbed will be 94,284 B.Th.U., of which the generator furnished 66,591 and the boiler 27,693.

The second reaction, $2H_2O + C = 2H_2 + CO_2$, means the decomposition of 36 lbs. of water and the gasification of 12 lbs. of carbon, resulting in the formation of 4 lbs. of hydrogen and 44 lbs. of carbon dioxide. The amount of heat absorbed in the formation of the hydrogen from water at 60° Fahr. will be 4 × 61,885 = 247,540 B.Th.U., of which 12 × 14,650 B.Th.U. will be supplied by the complete combustion of 12 lbs. of carbon to carbon dioxide (= 175,800 B.Th.U.), and 36 × 1153·9 = 41,540 by the steam, a total of 217,340 B.Th.U., leaving only 30,200 B.Th.U. to be furnished by the combustion of fuel in the generator. The bulk of gas produced will be 755 cubic feet of hydrogen and 375 cubic feet of carbonic dioxide, a total of 1130 cubic feet. The number of cubic feet of gas in 1 lb. is 25·5, and the specific gravity ·515. The calorific value is 219 B.Th.U. per cubic foot, which is contributed entirely by the hydrogen; and in practice this small value would be further discounted by the presence of 33 per cent. of incombustible gas.

The consumption of material per 1000 cubic feet of gas produced will be 3·2 gallons of water and 11·8 lbs. of 90 per cent. pure fuel; and the heat absorbed, 71,740 B.Th.U., of which 30,200 are furnished in the generator and 41,540 by the boiler.

The first reaction is in many respects superior to the second. The product contains no incombustible and worse than useless diluent; whereas that from the second contains 33 per cent. of carbon dioxide, which not only contributes no heat, but must be raised to the flame temperature in the act of combustion, and thus heat is wasted. In addition, the flame temperature is lowered, which is a great objection in connection with incandescent lighting and high temperature applications in general.

We will now endeavour to approximate towards practical conditions by considering the thermal reactions indicated by a combination of the first and second reactions to the extent of 95 and 5 per cent. respectively. The formula represented by this is $21H_2O + 20C = 21H_2 + 19CO + CO_2$, equal to 378 lbs. of steam + 240 lbs. of carbon = 42 lbs. H_2 + 532 lbs. CO + 44 lbs. CO_2.

The bulk of the gas produced from these quantities of materials will be:

		Cubic Feet.		Per Cent.
Hydrogen . .	42 × 188·68 . . .	7,924·6	..	51·2
Carbon monoxide	532 × 13·48 . . .	7,171·4	..	46·4
Carbon dioxide .	44 × 8·52 . . .	375·0	..	2·4
Total . . .	618 lbs.	15,471·0	..	100·0

The heat of formation is:

	Absorbed.		Evolved.
Hydrogen, 42 × 61,885 . . .	2,599,170		
Carbon monoxide, 228 × 4421		..	1,007,988
Carbon dioxide, 12 × 14650 .		..	175,800
100 lbs. steam, 378 × 1153·9 .		..	436,174
Total	2,599,170	..	1,619,962
Balance, being heat absorbed		..	979,208 B.Th.U.

The gas contains 97·6 per cent. of combustible matter, the value of which we have seen to be 348 B.Th.U. per cubic foot; so its calorific value will be 348 × 0·974 = 339 B.Th.U. per cubic foot. The bulk of 1 lb. weight is 25·3 cubic feet, and the specific gravity is ·52.

The consumption of materials per 1000 cubic feet of gas produced is 24·5 lbs. of water and 17·2 lbs. of fuel; and the total absorption of heat is 91,486 B.Th.U., of which 63,292 are provided by the generator, and 28,194 by the boiler.

Heat Carried away by Gases Leaving Generator.

There are other incidental losses in practice to which attention may next be directed. Both the gases produced during the runs and the products of combustion during the blows escape and leave the generator at the full temperature of the same.

Taking the composition of blue water gas as 7 per cent. hydrogen, 86 per cent. carbon monoxide, and 7 per cent. carbon dioxide by weight, the specific heat at ordinary temperatures will be:

Hydrogen . . .	3·409 × 7	..	23·863	
Carbon monoxide.	0·245 × 86	..	21·070	
Carbon dioxide .	0·216 × 7	..	1·512	
Total . .	100	..	46·445	0·464 per lb. per ° Fahr.

The temperature of the generator may be taken as 2200° Fahr., and the gas will pass off at this temperature and will take away, as visible heat in addition to that absorbed by its formation (2200 − 60) × 0·464 = 993 B.Th.U. per pound. This is on the basis of the specific heat at ordinary temperatures. But we have seen that, while the specific heat of solids increases very slowly with rise of temperature, that of gases may be as much as 50 per cent. more, at a temperature of 2200°, as compared with that at 60°, as above quoted. Assuming an increase of 40 per cent., the 993 B.Th.U. should be advanced to 1390. At 25 cubic feet to the pound, this would be equivalent to 55,600 B.Th.U. per 1000 cubic feet.

The composition of the products of combustion as produced during the blow will vary according to the excess of air mixed with them. The best result in theory, which is hardly obtainable

in practice, is when exactly the quantity of air required to ensure the complete oxidation and combustion of the carbon is admitted, and no more. This will be in the proportion of 11·6 lbs. of air to every pound of carbon gasified. The reaction is: One lb. of carbon + 11·6 lbs. air = 3·66 lbs. of carbon dioxide + 8·94 lbs. of nitrogen, equal to 29 per cent. of carbon dioxide and 71 per cent. of nitrogen. The air is injected into the generator by means of the blast fans.

The specific heat of carbon dioxide and nitrogen, respectively, is shown by Table VII. to be 0·325 and 0·257; so they may be taken, for the present purpose, as 0·34 and 0·27. The specific heat of the products of combustion, at 2200°, will therefore be in the neighbourhood of:

Carbon dioxide . . .	29 × ·34	..	9·86
Nitrogen	71 × ·27	..	19·17
Total	100	..	29·03 or 0·293 per pound.

The heat that is carried away as visible heat will be 12·6 × ·293 × (2200 − 60) = 7990 B.Th.U. per pound of carbon gasified.

Work Done by the Fuel.

We may assume the calorific value of the 90 per cent. pure coke, when completely converted to carbon dioxide and ash, as 13,000 B.Th.U. per pound. Of this, it is seen that 7990 B.Th.U. are carried away as visible heat by the products of combustion; leaving only 5010 B.Th.U. available for useful work in the generator. We will further assume that the generator contains, when fully charged, a ton of coke, and that the make of gas per run is 1000 cubic feet. This corresponds roughly with the size known as 200,000.

On first starting the plant, the interior of the generator and its contents must be raised to a working temperature of 2200° Fahr. Taking the coke as being charged into it at a temperature of 60°, and the specific heat of coke as 0·2, the heat required for this purpose is (2200 − 60) × 2240 × 0·2 = 958,720 B.Th.U. About 1-15th part of this quantity will be required at each blow to replenish the temperature lost during the preceding run.

We are now in a position to summarize the consumption of coke per 1000 cubic feet of gas produced.

To form carbon monoxide and dioxide		17·2 lbs.
,, supply heat carried off as visible, 55,600 ÷ 5010		11·0 ,,
,, consumed during the blow, 63,010 ÷ 5010 .		12·6 ,,
,, heat of formation, supplied by the foregoing		..
Total		40·8 lbs.

Losses due to radiation and conduction from the exterior surface of the generator are to some extent included in the above, and there is probably some duplication in other respects.

Perhaps it should also be mentioned that the consumption of coke, as above stated, must not be confounded with the requirements for carburetted water gas, which, as will be seen later on, consists of a mixture of blue water gas and oil gas.

(To be continued.)

SOME ECONOMIC CONSIDERATIONS AFFECTING BOTH CAPITAL AND LABOUR.

By Thos. Newton.

Among the many legacies of paramount importance which will be bequeathed to this nation as a result of the colossal conflict in which we are at present engaged is a cluster of economic problems, affecting all industries, which will tax the abilities and resources of our commercial and professional men, no less than those of the statesmen. It is becoming increasingly apparent that, unless victory is ultimately achieved in the economic sphere, our impending military triumph will prove abortive, and will serve but as a fresh starting point for the enemy to renew his strenuous preparations with a view to our complete and utter discomfiture in the future.

The Paris resolutions may be, and undoubtedly are, excellent on paper; but unless they are willingly and delightedly put into practice—not merely according to the letter, but intensely, according to the spirit—there is a grave danger that all our sacrifices will have been made in vain. The nation has been too content in the past to jumble together commerce, business, and politics in a happy-go-lucky sort of fashion—ever ready to fight over non-essentials, to the almost utter exclusion of a sane consideration of those essential factors which are vital to the national existence and well-being. Having concentrated on the village pump, our rulers have been admittedly oblivious to those world-happenings around us, and to that "peaceful penetration" of an unscrupulous enemy which threatened, and came within an ace of ruining, our commonwealth.

It is generally agreed that the national security should be firmly established and effectively maintained at all costs; and this should equally apply to security in the economic sense. The national life should be supremely and jealously guarded in peace as in war, and anything which tends to undermine the interests of the nation from an economic standpoint should be examined carefully with a view to its elimination. The Manchester school of thought undoubtedly performed a useful function in its day. But the policy of *laissez faire* has now become impossible in the light of recent experiences; and nowadays it is recognized that individual interests should be subordinate to national interests, which unquestionably must reign supreme. Commerce should be dealt with not only commercially, but as a means to an end—that of consolidating national and Imperial interests. The lesson has been too costly in blood and treasure to be entirely ignored; and drastic re-organization is essential, as regards the economics of industry, if we would not wilfully blind ourselves to the possibilities involved.

The proposed "Extension of Unemployment Insurance Act, 1916," contains the germs of a policy which may be prejudicial or beneficial (to the gas industry among others), according to whether the intention of the Government is to subsidize unemployment or industry. But it is quite conceivable that injury may unwittingly be inflicted on those whom it is intended primarily to benefit. And the inclusion of the manufacture of chemicals in the new list of industries embraced is a very serious portent. One wonders whether, after all, the manufacture of chemicals, and all that is involved under this heading, is expected to decline to such an extent as to warrant special unemployment provision being enacted for the workmen engaged in this important industry of many ramifications. Has not the lesson yet gone home? And is a return to the *status quo ante bellum* contemplated or desired?

Economics generally, and theories of value particularly, are to-day in a state of flux. It would be safe to say that rather more than a decade ago the labour world adhered to the theory of value as expounded by the Manchester school; but from then to just before the commencement of the war, a gradual conversion towards the Marxian theory of value took place, until to-day, under abnormal conditions, theories have been cast to the winds, and value has lost its true perspective altogether.

A point of great importance that is too apt to be lost sight of as regards the remuneration of labour, is that "nominal" wages are not always identical with "real" wages. Stated in its simplest form, the "nominal" wages in a given industry is the aggregate amount paid to those manually employed in that industry, whereas "real" wages is the aggregate amount paid, minus sundry deductions, subscriptions, contributions, levies, &c., which are disbursed in order to maintain the status of the workmen employed. It therefore follows that if the "nominal" wages in a given industry are comparatively high, and that the particular industry is sustaining an undue percentage of unemployed, the "real" wages of those actually employed are correspondingly and automatically reduced as a direct consequence. In other words, unemployment, *per se*, is subsidized, and employment penalized. The penalty is none the less real simply because under the National Unemployment Insurance Act it is shouldered by all the employed who come within its ambit—it is merely spread over a larger area.

This, then, brings one to an economic question of paramount importance, and one that will inevitably loom largely before the public in the near future as a result of this devastating war. The question, devoid of all trappings, may be simply stated as follows: Which is the better policy, and which in the long run will yield the most profitable results in the highest national interests—to subsidize commerce and industry or unemployment? If it be decided to encourage commerce and industry, the decision necessarily raises large economic issues; and some economists, on the strength of this decision, would at once postulate the effective absorption in industry of large numbers of skilled and unskilled workmen who would otherwise be thrown on the National Unemployment Insurance funds.

The gas industry may be regarded as a naturally protected industry, and it has little to fear either as regards raw materials or finished products. But it should not, on this account, be too hastily assumed that no benefit can possibly be derived from the policy of encouraging other industries. As a matter of fact, this latter is the greatest of all fallacies, which every gas manager in the kingdom has probably demonstrated to his entire satisfaction. Obviously, in these days of gaseous energy as regards heat, light, and power, the more industries that can be established and maintained, the greater will be the aggregate gas consumption. And, incidentally, it should be borne in mind that an increased aggregate gas consumption means an increased economic use of coal. It would be easy to dilate on the advantages which accrue to the nation by the economic use of coal; but these, happily, are now thoroughly appreciated. An impartial consideration of all the economic factors confronting the nation, at once raises the question as to whether it would not be better for all concerned to discard the *rôle* of being a nation of shopkeepers, in order to become a nation of producers. [At all events, the gas industry should be under no delusion as to which is the better policy to pursue.]

Two theories are thus brought into juxtaposition—one implying a self-contained community, or a community self-contained as regards all essential things and processes, and the other implying a community absolutely, or very largely, dependent upon external supplies which, as we have already experienced, may be dominated by a potential enemy. One theory postulates the employment of the maximum amount of industrial effort, and all that this involves; while the other theory implies the minimum. On the one hand, industry would be fostered and employment encouraged; on the other, industry would be discouraged, and unemployment subsidized. Above and beyond these considerations, the development of one theory would strengthen and consolidate national and Imperial interests; while the adoption and retention

of the other would jeopardize not only national interests, but national life itself.

The humiliating revelation of having been so utterly dependent on enemy sources as regards some of our essential key industries is an experience that none of us wants to see repeated. Indeed, it is a pleasant reflection that the interests of the gas industry coincide with the highest national interests in adopting an entirely different policy. Regarded from one standpoint, the manufacture of gas and the recovery of the resultant bye-products may be termed the largest and most important manufacture of chemicals in the country; and any legislation affecting the latter should be duly noted by all those interested in the former.

Many speculations have already been made as to how, and in what manner, the claims of labour will be disposed of after the war; and in this connection many vital economic considerations have been raised. What will need to be strenuously guarded against will be the sudden unloading of a vast amount of potential labour on a falling market, with the expectation of bringing about a sudden reversion to ante-war conditions. It is extremely doubtful if the social structure could withstand so great a strain. Mere "unemployment benefit" would not suffice, since this, to be really effective, must act as a narcotic; and the resultant state of apathy which must necessarily follow is the very last thing to be desired. A carefully-concerted economic plan, if well thought-out now, would immediately, on the cessation of hostilities, act as a stabilizer, and an incentive to industry, with the result that those undue disturbances which paralyze industry and administer to the general discontent would thereby be reduced to a minimum.

The gas industry has everything to gain from the establishment and development of other industries; and this important fact should not be lost sight of for a moment. A community of interest necessarily exists in the progress of the gas industry and the effective development of other industries. Any encouragement offered to the latter is reflected in the former, and, in like manner, if other industries are unduly handicapped and discouraged, so also is the gas industry. The present war has shaken many beliefs, and upset many comfortable theories, but one fact which stands conspicuously clear is that the national life and well-being in the future will depend on the development of productive industry to a much greater extent than it has ever depended before. Hence the formulation of a definite economic plan of campaign is now an imperative necessity. Given such a definite plan, the cessation of hostilities would be the signal for "full steam ahead" as regards industrial expansion; and the resultant advantages and benefits would be fully shared by both the capital and labour interested in the gas industry.

Proceedings at the San Francisco Gas Congress.

In view of the fact that no less than twenty Gas Associations officially participated in it, one would have expected that a bulky volume would be filled by the proceedings at the International Gas Congress which took place at San Francisco in the autumn of last year; and the copy of the "Transactions" which has just come to hand amply justifies such an anticipation. The book—which is edited by Mr. George G. Ramsdell, the Secretary and Treasurer to the Congress, as well as to the American Gas Institute—with its full index, runs to nearly 700 pages; and there are, in addition to the illustrations inserted in the reading matter, quite a large number of plates. With so wide a range of subjects as was covered by the papers and discussions at the Congress, there is interest in the record for all gas men, no matter in what particular branch of the industry they may happen to be engaged. Mention of each subject is impossible here; but it may be asserted that the final paper is one which those who had the good fortune to be present at the Congress will certainly turn to for the purpose of refreshing their memories in time to come, for it deals fully with the illumination of the Panama-Pacific International Exposition. The author of the paper was Mr. W. D'A. Ryan, Chief of the Department of Illumination; and his description is illustrated by a score of photographs. Speaking, by the way, of photographs, mention should also be made of another feature of the book, which is the portraits of Mr. Alex. C. Humphreys and the other 32 officers and representatives on the Joint Committee of the Congress. The Editor and others concerned in the preparation of the volume have done their work well.

National Insurance (Part II.) (Munition Workers) Act, 1916.—The Umpire has decided that contributions are payable in respect of workmen engaged in the manufacture of metal electric light and gas fittings, including pendants, brackets, metal hall lamps, main cocks, unions, swivels, &c. The contributions do not begin to be payable until Sept. 4. The Umpire has decided that contributions are not payable in respect of workmen engaged in the manufacture of gas-mantles for sale to munition factories.

Thorium Content of Travancore Monazite.—Pointing out that since the war the control of the Travancore monazite coast sand has passed from German interests to an English company, the "American Gas Light Journal" remarks that this sand contains nearly twice as much thoria as the monazite of Brazil. Some time ago, it is added, scattered deposits of monazite were found in Ceylon, which contained over 80 per cent. of thoria, as against about 5 per cent. in the Brazilian monazite. This provided grounds for the hope that the material would also be found in India; and Government investigations bore out this belief.

COKE-OVEN MANAGERS' ASSOCIATION.

Formation of a Midland Section.

A Special Meeting of the Midland and South Yorkshire members of the Coke-Oven Managers' Association was held last Saturday at the Grand Hotel, Sheffield, under the chairmanship of Mr. GEORGE CHRISP (the President), with a view to the formation, under the new scheme of constitution of the organization of the Association, of a Midland Section. The attendance was only small, attributable to bad weather and to a considerable proportion of the members being away on holiday.

The PRESIDENT explained the scheme under which it was intended to divide the Association, now that it has grown into a national organization, into sections for different areas of the country, and the particular area which had been the scene of the foundation of the Association was to be the Midland Section. It would embrace the industry in Yorkshire, Derbyshire, Nottinghamshire, and Lincolnshire. The other sections were the Northern, embodying Northumberland, Durham, Cumberland, and Scotland; the Western, embracing Staffordshire, Lancashire, Salop, and North Wales; and the Southern, embracing South Wales and any other southern areas. It seemed to be the general desire of the industry throughout the country that they should follow these lines; and the existing General Council were entirely in agreement with the idea. They felt that they in South Yorkshire could not pretend to control the affairs of the whole country; and it was for them now to appoint their own section officers and Committee, and also to elect their representatives to sit on the new General Council. Each section was to elect a certain number of members of their Committees to constitute the General Council. A series of suggested rules had been drawn up by the existing Council. The title, objects, terms of membership, and other points remained as before. The Councils were each to consist of the Chairman and joint Secretary and Treasurer of each Section, who would sit *ex officio*, with the addition of one elected representative for the first 16 full members of the Association, and one for each succeeding eight full members; no provision being made at the moment for direct representation of associate members on the General Council. The Midland Section, therefore, having at present 38 full members, would be entitled to send its two officers and three elected representatives. The section was about equal in strength to the Northern Section. Any member of the section may nominate any other member for a seat on the Council; but these nominations must be supported by two other members. For the moment, the existing General Council were acting, necessarily, as the Section Committee; and they now required sanction to send out nomination forms for the appointment of members of the local Committee and also for the General Council for the next year. If this course were accepted, the papers would be issued within a couple of weeks. All nominations should be returned in good time for the annual meeting of the Association in October. If the number of nominations should be insufficient to make up the constitution of the Council, the existing Council had power to fill the vacancies by co-opting members. The nominations should be delivered to the Secretary within 28 days of the constitution of any new section; and a full list of them would be sent to every member at least seven days before the annual meeting. The voting, according to the rules, was by ballot; so that a man who found himself unable to attend the annual meeting would still be able to record his votes by sending them on the ballot papers. He would be glad to answer any questions on the matter.

The HON. SECRETARY (Mr. J. T. Price) explained that the Durham, Staffordshire, and South Wales members had already formed their area sections, and had appointed their Committees and were preparing for next year; and the idea was to get the Midland Section going, so that they would not be behind the other areas.

The PRESIDENT said, so far as the secretarial work went, he did not suppose they could do better than let Mr. Price continue. The present Council certainly remained as the governing body until October. The Hon. Secretary then, whoever he might be, would have little time to prepare for the winter session; and he thought perhaps Mr. Price could be proceeding in this direction. He could not see that it was necessary for that area, which was already in existence, to go through the formula of sending in a requisition for the formation of a section, as was laid down in the latest rules for the establishment of branches. They would simply slide into their place automatically. All they needed to do was to sanction the mode of procedure suggested by the existing Council for the election of a branch committee and officers.

Moved by Mr. P. B. NICHOLSON, and seconded by Mr. G. H. LANT, it was agreed that the Secretary be empowered to get out nomination forms and issue them to the members of the Midland area, and to prepare for the ballot.

The HON. SECRETARY: Then we shall require another meeting like this for election, before the October general meeting.

The PRESIDENT said that was so. They would require a special meeting to elect their own officers from the nominations, and also to appoint representatives to the General Council.

The HON. SECRETARY: The difficulty is this, that the nominations for the General Council would be given out in October. Do you not think we in the Midland Section had better get into existence

before then, in readiness for the October meeting? We want to be ready to get into position the same as the other sections.

The PRESIDENT said the first papers could be issued within about a week from that evening, giving the members a fortnight in which to return them. The Council could then meet and consider them, and then give the seven days' notice and issue the ballot papers; so that they could not have the next meeting within five weeks.

A MEMBER: These rules are not yet in order for the General Council.

The PRESIDENT: That is so; but they are the things which have been wanted by the membership generally from all areas, so far as could be gathered at previous meetings. The Midland Section must act on the assumption of their acceptance, and apply them to their own needs.

The HON. SECRETARY thought they would have to have separate forms as between nominations for their own officers and committee and for representatives on the General Council, because the present Council would later be sending out nomination forms for the next year's Council to all branches.

Mr. GREENE advocated the election of the branch committee first, entirely separately, in order to avoid confusion and the possible loss of the services of some valuable man who might be nominated for branch chairman or for the General Council and fail to be elected, and yet who might have been a very useful man on the local committee, but might not have been nominated for that post in view of his other nomination.

The HON. SECRETARY said that, after all, even though they did already exist in actual fact, it might perhaps be better to strictly follow the new rules for branches and go through the formula of sending in a requisition to the existing General Council before forming the Midland branch.

The PRESIDENT said this would mean further delay.

The question then arose as to whether there were sufficient full members present that evening to proceed with the formation of a local branch; but a glance round the room showed that there were.

Mr. GREENE said a course had suggested itself to him. As the notice of that meeting said "Election of Officers," would it be well to nominate officers at once and call another meeting for their election temporarily? This would obviate any dual position of anyone.

The HON. SECRETARY said the other three sections had already been formed, and he was afraid the Midland Section would be too late for the annual meeting of the Association if they waited.

The PRESIDENT suggested that they should at once propose that a Midland Section be constituted, and proceed to elect the members of the present Council as a local committee for the remaining two months of the present year, and then they could proceed with nominations for the Committee for next year.

The HON. SECRETARY expressed the view that it would be better to follow the lines first suggested, and draw up nomination forms for the officers of the Midland Section only, and call another meeting.

Mr. NICHOLSON: You are infringing the rules for sections. Nobody has signed any requisition for this Midland Section.

The HON. SECRETARY: Has any branch yet carried out these rules?

Mr. GREENE: No; the rules were not drawn up when the other branches were formed.

The PRESIDENT said he did not think it was at all necessary that there should be a requisition in their case. The proposals before the meeting had been drawn up by the General Council; and if they could not fall in with them, they had some work on hand. He felt the best thing would be for the meeting to accept the suggestions from the Council that they form a section, and for them to elect the present Midland members of the Council as the Section Committee for the two months, and then go on with nominations for next year.

Mr. GREENE said this seemed the easiest way out of the difficulty.

The PRESIDENT said he felt that if the members did not attend the meeting they should still have full opportunity to vote on the final elections.

On the motion of Mr. J. A. WILSON, seconded by Mr. T. A. LONG, it was agreed that the proposals of the General Council in regard to the Midland branch be accepted.

On the proposition of Mr. LONG, seconded by Mr. LANT, it was resolved that the Midland area members of the present Council—Messrs. Chrisp, Haigh, Price, Long, Carr, Hatfield, Riley, Nicholson, and Marshall—constitute the Section Committee for the remaining two months of the present year.

The PRESIDENT: Meanwhile, the Secretary will get out nomination papers for the Committee for next year.

It was further agreed that the nomination papers should be of a combined character, for nominations for local officers and committee and for representatives on the General Council.

Mr. NICHOLSON then moved that eight members, inclusive of officers, should be the standing number of the local Committee.

On a suggestion that the local Committee should be of such a size in future years that they could, *en bloc*, represent the Section of the General Council,

Mr. FLEMING submitted that, according to the rules, associate members had a right to be on the local Committee, whereas they had, at present, no place on the Council. If they were going to have the Committee on the Council *en bloc*, what was the position of associate members? They could never be elected on the local Committee, and yet they had a right to be so elected.

The PRESIDENT said the meeting had already elected a Committee for the present year, which, to his personal regret, embodied no associate members. In the Midland area, they had a large proportion of full members; and it had not hitherto been thought necessary to have associate members on the Committee. This matter, however, should be brought up by Mr. Fleming at the coming general meeting, when, he understood, the associate members were to put forward some proposals as to their position.

Mr. WORTHINGTON said they had agreed to the present General Council's proposals for the Midland branch. They had not, however, accepted the General Council's rules and regulations. Could not they, as a branch, make an alteration so as to admit associate members on the Committee?

The PRESIDENT said at the general meeting, when the question of the position of associate members was to be brought forward, they would find a considerable proportion of the full members would be entirely in sympathy with the associates.

Mr. GREENE said it seemed to him that they had been trying to form the local Section on the local scheme suggested by the present Council, but not on the rules at present existing, which were expected to automatically cease to operate at the end of the present year.

Mr. TAYLOR, speaking as an associate, asked if any full member would propose that in future the qualification for full membership be that a man must be a coke-oven manager.

The PRESIDENT said the suggestion could hardly be dealt with that evening.

Mr. WILSON: That was in our original constitution. It has since, I think, been altered to admit tar distillery managers, &c.

The HON. SECRETARY still held that they ought to follow the existing rules and send in a requisition.

The PRESIDENT did not agree, because they were already in existence, and could not afford time to begin creeping again.

Mr. GREENE reminded the meeting that the other branches had been formed before these rules were drawn up.

The HON. SECRETARY thereupon suggested that, according to the present branch rules, the other branches did not appear to be properly constituted.

The PRESIDENT held that the case of the Midland area was quite exceptional, at any rate. These rules were prepared for the creation of new Sections entirely.

Mr. BISHOP seconded Mr. Nicholson's proposition that eight members constitute the branch Committee, including officers; and the motion was carried.

BYE-PRODUCTS RECOVERED IN THE MANUFACTURE OF COKE.

By WILLIAM H. CHILDS, President of the Barrett Company, New York.

[Extracts from a Paper read before the American Iron and Steel Institute, May 26.]

(*Continued from p.* 351.)

GAS.

Coke oven gas is, in a way, the "joker" among the cards in the bye-product coke man's hand. It may be worth a great deal for illuminating purposes, or it may be worth only its fuel value as against coal under steam-boilers. In the first instance, it brings from the consumer, let us say, about 60 c. per 1000 cubic feet, or, allowing for purification and distribution, about 30 c. net. For fuel under boilers the usual price is about 4 c. per 1000, depending on the price of the coal it displaces. Modern coking practice easily recovers 6000 cubic feet of surplus gas per ton of coal carbonized. At 30 c. this would be $1.80 per ton of coal, as against a credit of 24 c., which would be the other extreme. Where a new plant is under consideration there is an ample reward here for wise planning and successful negotiation. Unfortunately, success in finding such a market for the gas is in many cases a difficult matter; the reasons usually being the existence of a regular supply of natural gas, or the lack of cities of sufficient size within piping distance to make the arrangement mutually profitable.

The amount of coke-oven gas that is available in making bye-product coke for a modern blast-furnace is very large, and its relation to the consuming power of the usual city is not generally appreciated. For example, a modern plant of (say) forty ovens, which is about the minimum and corresponds to a 400-ton furnace, would produce about 3¼ million feet of gas per day. This under ordinary circumstances would supply a city of at least 150,000 inhabitants. There are only twenty-six cities of this size in the United States east of the Rocky Mountains, and all of these are supplied with gas, some of them with coke-oven gas. There are already upwards of forty-six bye-product coke-oven plants in existence, and some under construction. [A list of the places supplied wholly or in part with coke-oven gas, together with the price of gas, is given in a table.]

It has frequently been possible to supply a group of two or more towns from a single bye-product oven plant, as in the case

of the plant at Camden, N.J., which also supplies Trenton, Plainfield, New Brunswick, Gloucester, Burlington, and other towns, through high-pressure transmission lines, or the plant at Joliet, Ill., which also serves Aurora, Elgin, and La Grange, Ill.

A fair typical analysis of rich gas from coal of 30 per cent. volatile matter would be as follows:

	Per Cent.
Methane	31·0
Hydrogen	48·0
Illuminants	5·0
Carbon monoxide	6·0
Carbon dioxide	4·0
Oxygen	0·5
Nitrogen	5·5
	100·0

The caloric power of the gas will average between 580 and 620 B.Th.U. per cubic foot, and the candle power from 12 to 16. The lean or oven heating gas has in the neighbourhood of 500 to 580 B.Th.U. As the coking period has decreased to between sixteen and twenty hours in the latest ovens, the heat efficiency of the oven has increased, and with it the amount of surplus gas; but as the rich fraction is taken over a longer time, the quality of the gas is necessarily somewhat lower. As stated above, it is usual to estimate 11,000 cubic feet of gas from a ton of coal, of which 5000 cubic feet or less will be required for coking and 6000 cubic feet or more will be available surplus. Authentic reports are at hand which show a yield from a recent coke-oven plant of over 12,000 cubic feet of gas per net ton of coal, containing less than 5½ per cent. of carbonic acid and nitrogen. Of this gas less than 40 per cent. of the heat value was used in coking; so that the surplus corresponded to 7200 cubic feet. The coal was a mixture of 40 per cent. low volatile and 60 per cent. high volatile coal, which would average about 30 per cent. volatile. The total amount of heat lost in waste gases and radiation at this plant was less than 4½ per cent. of the total heat in the coal.

A large number of uses have been found for coke-oven gas around steel plants, aside from steam-raising, as in open-hearth steel furnaces, soaking pits, drying ladles, heating furnaces, &c. There is also a wide field, though not a particularly high-priced one, where natural gas for industrial purposes is failing. One important use—namely, for power development in gas-engines—has not received the attention in this country that it has in Europe. So far as information is available, the only large gas-engine installation using coke-oven gas in this country is at Lebanon, Pa., where four 1200 H.P. engines using gas from the Semet-Solvay plant there develop electrical power for operating the Cornwall Ore Banks. According to published data, gas-engines aggregating over 200,000 H.P. for operation with coke-oven gas have been installed in Europe by three of the principal builders since the year 1904. A guarantee of 1 H.P. per hour with 27 cubic feet of average gas is not considered out of the way, which would mean about 200 H.P. hours per ton of coal, or for each modern coke-oven the capacity to produce 125 H.P. continuously, while it is in operation. A battery of eighty ovens would yield 10,000 H.P.

While it is realized that various practical difficulties lie in the way before such results may be arrived at, there is good reason to think that they have been overcome by others, and that the prospect is by no means a hopeless one.

Benzol, Toluol, and Xylol.

The recovery of benzol, together with its homologues, toluol and xylol, is more properly dealt with in connection with the gas than with the tar, as by far the larger portion of these oils is found in the gas, although chemically they are classed with the coal-tar derivatives. There is, of course, no exact proportion; but a recovery of 2½ gallons of light oil from the gas from one ton of coal carbonized is common, while the corresponding fraction of the tar would probably be less than one-tenth of a gallon.

The actual recovery of benzol is a relatively simple matter. It is based upon the property of certain high boiling oils to absorb the crude benzol vapours from the gas, and to yield them up again when heated to a temperature below their own boiling point. The oils employed for this washing are the so-called petroleum "straw" and tar creosote oils. English practice prefers a tar creosote oil distilling from 220° to 250° C., though heavier oils distilling from 250° to 300° are also used. All the American benzol plants use the petroleum straw oil because it is cheaper than coal-tar oils, and the benzol can be more sharply separated from it in the type of continuous still used.

The washing of oven-gas with oil for benzol is practically parallel to the washing with water to recover ammonia; the guiding principle being to bring the gas into intimate contact with a maximum surface of the cool washing liquid. The benzolized oil passes from the washer through a preliminary heater to the still, where the benzol vapours are driven off by a combination of direct and indirect steam. The exit oil is cooled and returned to the benzol washers, while the benzol vapours pass to the condenser and are delivered as light oil. This contains possibly 10 to 15 per cent. of toluol, and 45 to 55 per cent. of benzol, with small amounts of xylol and naphthalene. From this crude light oil, the refined products are obtained by successive distillation and by treatment with the sulphuric acid and alkali. Benzol is usually made as 50 per cent., 90 per cent., and 100 per cent. grades—the percentages referring to the amount that will distil over at 100° C.—not to actual purity. For pure benzol, the specification requires that 100 per cent. shall distil over within a range of 2° C., within which range shall be the true boiling-point of benzol.

Benzol recovery has long been a part of regular condensing-house practice in Germany. As but little of the German coke-oven gas is used for illuminating purposes, the loss of candle power due to benzol removal is not of much importance, and the loss of heating value only amounts to 3½ to 4½ per cent. The large amounts of benzol so recovered have furnished not only the raw material for this portion of the chemical and dyestuff industry, but also the greater quantity used for gas enrichment, solvents, and motor fuel.

In the United States most of the coke-oven plants that make illuminating gas have until recently found a good market for their benzol by leaving it in the gas to increase its candle power. But even where the gas was used exclusively for fuel, the operators have been slow to instal benzol-recovery plants because of the limited demand in chemical manufacture, and the low price of gasoline, which now occupies the field as a motor fuel. Up to the time that the European war began, benzol recovery was confined to the plants of one organization, although several others had recently made contracts for benzol installations.

Until the war demands for benzol and toluol arose, their chief uses in this country were as solvents for rubber, in paints and varnishes, paint and varnish removers, grease extraction, imitation leather, and as a basis for making other chemicals, as anilin, benzoic acid, saccharin, &c. With the outbreak of war, a complete change has come over the benzol situation. This country found itself with a growing demand for benzol and toluol derivatives, and at the same time deprived of any outside source of supply.

Toluol, the basis of trinitrotoluol, or "T.N.T.," now the most fashionable explosive in European war circles, jumped from 30 c. a gallon to $4.50 or upwards. Benzol, in moderate but increasing demand at 25 c. a gallon, suddenly climbed to 80 c. as the basis of synthetic phenol—an essential in making picric acid, and for the manufacture of anilin oil, an important factor in the dyestuff industry.

Accordingly, benzol-recovery plants were installed right and left, as rapidly as they could be constructed, and are now in operation or contemplated at nearly all the bye-product coke plants. The estimated figures for the production of light oils from gas washing, so far as they are obtainable, indicate that in 1914 about 6 million gallons were made, and in 1915 about 14 million gallons. For the year 1916, if all the existing works and those expected to come into operation are kept in service, it is expected that the output will exceed 22 million gallons. If we assume that all the metallurgical coke now used was made with benzol recovery, the quantity of refined benzol available would be upwards of 100 million gallons per year. In such circumstances it would have to be used as a motor fuel, on the same basis as gasoline. The gasoline consumption of the United States is estimated at over 1000 million gallons; so that even if the present maximum recovery of benzol were made, the total would equal only 10 per cent. of the gasoline now used.

Cyanogen.

The gas from the bye-product coke-ovens or gas-retorts usually contains hydrocyanic acid (HCN), either in the form of the acid itself or as ammonium cyanide; its presence being usually attributed to the breaking-down of ammonia on exposure to heated coke or other heated surfaces. The iron oxide purifier removes a variable amount of cyanogen (CN) from the gas; the spent oxide being sometimes purchased from gas-works when the cyanogen content justifies it, and worked-up into yellow prussiate of potash or some equivalent form.

The direct removal of cyanogen from coal gas may be accomplished by any one of several methods, among which are the Bueb, the Davis-Neill, the Feld, &c. The former is perhaps the best known, and is in operation at the Astoria works of the New York Consolidated Gas Company. Its product is an insoluble cyanide sludge, ammonium ferro-ferrocyanide, which is sold on the basis of its cyanide content, calculated as yellow prussiate of potash. As present prices for sodium salts are very materially lower than those for potash, the sodium ferrocyanide is made. Owing to the use of a ferrous sulphate solution as the medium for absorbing the cyanogen from the gas, the ferrocyanide is the usual form of recovery.

Until recently there have been few gas-works or coke-oven plants recovering cyanides from their gas in this country. Late developments indicate, however, that several new plants are about to begin operations. Under normal market conditions, there is probably little profit to be obtained from their recovery from coal gas. The normal price of prussiate of potash before the war was 9 c. and 10 c. a pound; owing to war conditions, the present price is about 60 c.

Estimating the cyanogen in the gas at 1 lb. per net ton of coal carbonized, equivalent to about 2·6 lbs. of yellow prussiate of potash, the output of a modern plant of eighty bye-product ovens would be about 3000 lbs. of prussiate per day, or 1,000,000 lbs. per year.

(To be continued.)

Exports of Solvent Naphtha.—The Director of the War Trade Department announces that the Department are now prepared to consider licences for the export of solvent naphtha (provided that it contains less than 5 per cent. of toluol) to the British Colonies, the United States of America, and the Allied countries, with the exception of France.

KEROSENE SHALE AS A GAS AND POWER PRODUCER.

Kerosene shale, or torbanite, is a mineral known only to exist in three countries—Scotland, France, and Australia—and its use as a gas and power producer formed the subject of a paper read last June by Mr. E. V. Espenhahn before a meeting of the Victoria Section of the Society of Chemical Industry. The most extensive deposits of the mineral are in Australia; and they occur in New South Wales and Tasmania.

Authorities have, said the author, been in conflict as regards the origin of kerosene shale, and as to deciding whether to designate it as a coal or to assign it a place by itself in the classification system. According, however, to the latest researches, kerosene shale consists of an ulmic precipitate and vegetable *débris*, containing algæ, spores, and pollen grains, contaminated with varying proportions of foreign or mineral matter. Microscopic investigation has further revealed that richness or purity is dependent on, and proportional to, the amount of organic bodies present, which determines the ratio of volatile matter to fixed carbon, and constitutes the features of kerosene shale. This ratio affords a definite line of demarcation between kerosene or oil shales and the ordinary variety of black cannel coals. It also allows the separation of the lowest grades of the former from the latter, although between the first two an arbitrary division is only possible based on the proportion of ash.

Carne, in his "Kerosene Shale Deposits of New South Wales," distinguishes the three minerals as follows: The ulmic precipitate and vegetable *débris* of Bertrand and Renault, or the macerated pulp of other authorities, slightly associated with spores and pollen and a varying admixture of muddy or mineral matter, would presumably account for ordinary cannel. A similar base, intimately mixed with a greater or even preponderating quantity of spores and pollen, constitutes brown cannel, kerosene shale, or torbanite. An intimate mixture of the above constituents with a largely preponderating mass of inorganic muddy or mineral matter would compose shaly cannel or oil shale.

Greatest importance is attached to the second mineral, as with it is associated the extensive mineral oil industry of Scotland, of which huge deposits are known to exist in Canada, which so far are practically untouched. The history of the once-flourishing mineral oil industry in the Mother State belongs to the past, as it has been unable to survive competition with the oil products from the United States and elsewhere. The introduction of a protective tariff would undoubtedly resuscitate this important industry, as pioneering work has been carried out in most of the localities where deposits are known to exist. It would also open up others in Tasmania, where prospects for the establishment of the industry on a large scale are particularly bright. Australia would thus be placed in a more independent position as regards oil fuel.

To within recent years, a great proportion of the better class of shale mined in New South Wales has been exported for use as a gas-enriching material, and replaced the Scottish boghead or torbanite, the deposits of which were exhausted shortly after their discovery. With the introduction of a more lenient illuminating standard, and its abolition in other quarters, for a calorific standard, materials for carburetting purposes as such have lost their former importance, resulting in a falling off in the demand for the Australian mineral. Tests carried out under actual working conditions show that the mineral yields a great quantity of gas of high illuminating power.

TABLE I.—*Carbonizing Tests of Kerosene Shale.*

Test.	Ultimate Analyses of Sample.				Gas per Ton. Cubic Feet. 60° Fahr. 30 Ins.	Ill. or Cal. Power of Gas.	Lbs. Coke per Ton.	Percentage Ash in Coke.	Tar. Galls. per Ton.
	Moisture, Per Cent.	Ash, Per Cent	Fixed Carbon, Per Cent.	Volatile Matter, Per Cent.		Candles.			
Gas Light and Coke Company, 1877, Hartley Vale shale	..	22·0	8·0	70·0	15,399	46·35	504	74·5	40·0
G. R. Hislop, 1898, best grade New Hartley shale . .	0·76	16·30	20·90	62·04	17,160	43·62	833	43·8	30·3
H. Bunte, Carlsruhe experimental station, 1909 . .	0·33	29·78	13·28	56·61	15,085	B.T.U. Gross. 1052	967	69·2	30·65

In contrast to bituminous coals, only a small proportion of the total calorific value is retained by the coke, and is dependent on the amount of fixed carbon originally present. The coke, having a high percentage of ash, is thus rendered useless for ordinary firing purposes. Further, with the shales a relatively high percentage—about 30 per cent.—of the total thermal units escape as tar, which is not in a form to permit its economical use as a heating or power agent as gas without further treatment.

An investigation by W. Seeger, Dr. Ing, and the author, was carried out in Professor Bunte's laboratory in Carlsruhe, with a view of ascertaining conditions for the production of a gas possessing a gross calorific value of 520 to 560 B.Th.U. per cubic foot by utilizing the total volatile matter available in the mineral. Sufficient mineral was broken-down to last all the tests. The first experiments show the quantities of oil and gas recovered by destructive distillation under varying conditions. The finely-broken mineral was distilled first in a hard glass Jena retort, then a copper retort as used for tar distillation, and lastly a specially constructed iron retort. By the first two methods, 200 grammes were subjected to a gradual rise of temperature by heating with bunsen burners, until after three hours the contents had attained a temperature of 700° C., and no more distillate appeared. By the third method, 100 grammes were placed in a vertical iron retort heated in the constant temperature zone of a 45 cm. platinum resistance furnace. Table II. shows the results of the first three experiments.

TABLE II.—*Distillation of Kerosene Shale.*

Experiment No.	Products of Distillation.	Percentage Weight of Shale.	Gross Calorific Value.	Percentage of Calories of Shale.	Cb. Ft. Gas per Ton, 60° Fahr. 30 Ins.	Specific Gravity.
	Coke	42·26	7,222	22·2	..	..
1	Oil	48·38	18,522	65·2	..	..
	Gas	9·36	1,175	10·2	2,700	·90
	Coke	42·17	7,007	21·5	..	..
2	Oil	46·35	18,396	62·0	..	..
	Gas	11 41	1,268	14·2	3,460	·98
	Coke	40·20	7,342	21·4	..	..
3	Oil	41·90	18,016	54·9	..	..
	Gas	17·90	927	21·4	7,120	·70

Experiment No.	Composition of Gas, per Cent.						
	CO_2	C_nH_m	CO	H_2	CH_4	C_2H_6	N_2
1	3·18	11·74	4·83	24·10	20·16	33·00	2 98
2	3·61	20·46	3·61	19·24	21·38	29·82	1·88
3	1·77	16·77	3·42	36·11	26·46	15·59	0·88

Of all products, the coke residue, containing about 52 per cent. ash, shows least variation, but is lowest in the iron retort, where a temperature of 1000° C. was attained. About one-fifth of the total calories of the shale is retained as fixed carbon. Of the total volatile matter, representing the remaining 80 per cent., at most 30 per cent. is recovered as gas. Decomposition of the volatile products took place in the iron retort, resulting in a higher yield of gas of lower quality and less oil. A further increase in the gas yield was effected by cracking the volatile products after their formation. For each experiment 100 grammes were used. With experiments Nos. 4 and 5, the volatile products were exposed to a temperature of 800° C., and for experiment No. 6, to 1000° C.

By comparison with experiment No. 3, it will be seen that cracking at 800° C. has resulted in an increase of the permanent gases by 240 per cent., which are of approximately the same calorific power as the gases formed by simple distillation in the iron retort. Attributing the extra yield of gas to the oil primarily formed—namely, 95 cubic feet per gallon—this oil compares favourably with a gas oil derived from brown coal or mineral oil. At 800° C., with varying rates, the gaseous products differ little in composition, and the amounts remain the same—showing that at this temperature secondary decomposition of the gas formed hardly takes place within reasonable rates of travel. It also follows that a limit is placed on the ultimate yield of gas at any one temperature, and that this amount cannot be increased above a certain degree. Cracking has also resulted in the conversion of all hydrocarbons condensed as tar into those of the aromatic series, as well as in the formation of free carbon. This carbon and the tar still account for 23·5 per cent. of the total calories of the shale.

At higher temperatures, the volatile products undergo further decomposition. At 1000° C., the gas increased by 50 per cent., though at the cost of the calorific value, which decreased by 40 per cent. Decomposition of the unsaturated hydrocarbons and ethane resulted in the loss of carbon in gaseous form, so that the total heating value (calorific power × yield of gas) decreased by 7 per cent. As the volume of gas is primarily dependent on, and in proportion to, the available hydrogen $\left(H_2\,\% - \frac{O_2\,\%}{8}\right)$ in the original material, it is not possible to increase the yield by cracking above a certain degree. Splitting-up of the hydrocarbons both from the oil and gas takes place; and the ultimate products vary according to the temperature and the degree of contact. Thus, in experiment No. 6 the tar consisted practically of free carbon.

At these temperatures, it was considered that the deposited carbon could be recovered in the form of water gas, thereby increasing the yield and the total calories available in gaseous form. To this end, the conditions of the last experiment were modified to carry out the cracking of the volatile products in an atmosphere of steam. The results of five experiments are set down in

Table IV. The gas yield is considerably greater than of any former experiment; and the tar has been reduced to an almost negligible quantity of the total volatile matter. The calorific value of the gas under certain conditions is in the region of that usually demanded from illuminating gas, although it appears possible to vary it within fairly wide limits—more so than gas from bituminous coal by legitimate means, when following pure carbonizing methods.

TABLE III.—*Distillation of Shale with Cracking of Volatile Products.*

Experiment No.	Products of Distillation.	Percentage Weight of Shale.	Gross Calorific Value.	Percentage of Calories of Shale.	Cb. Ft. Gas per Ton. 60° Fahr. 30 Ins.	Specific Gravity.
4	Coke	40·9	7,342	21·8		
	Tar	23·4	13,754	23·4		
	Gas	34·9	918	50·8	17,050	·61
5	Coke	39 8	7,342	21·2		
	Tar	23·6	13,774	23·5		
	Gas	34·9	935	52·3	17,240	·62
6	Coke	40·6	7,342	21·4		
	Tar	33·1	13,118	31·6		
	Gas	25·3	558	44·1	24,350	·31

Experiment No.	Composition of Gas, per Cent.						
	CO_2	C_nH_m	CO	H_2	CH_4	C_2H_6	N_2
4	0·57	19·45	2·77	29·08	42·54	1·80	3·79
5	0·67	21·73	3·17	25·18	43·57	3·47	2·11
6	0·83	2·27	2·62	58·56	32·73	..	2·99

The high percentage of the unsaturated hydrocarbons in the gas compared with experiment No. 6 appears remarkable; but their survival or formation from the oil first formed by distillation may be accounted for by the influence of the steam. In the experiments at 1000°, the calorific power as well as the percentage of unsaturated hydrocarbons and methane is dependent on the amount of steam admitted with the volatile products and the degree of contact between the gas and the surfaces exposed. This latter factor is governed by the rate of the gas, and varies directly with the excess of steam—that is, its partial pressure in the gas mixture. Results do not show such conformity as to allow strict comparison, as it was difficult to maintain a steady pressure of steam. Moreover, to attain such results it would have been necessary to regulate the steam in proportion to the volatile products, which was hardly possible with small-scale experiments. The above values, therefore, can only afford an indication of the behaviour of the steam and volatile products under varying conditions.

The prospects of adapting the process for the manufacture of illuminating gas appear favourable. For a larger unit, the process being continuous, the regulation of the steam in proportion to the volatile products would prove comparatively easy. By determination of the most suitable temperature, and adjustment of the capacity of the reaction chamber (superheater) through which the gases travel, the volume of steam admitted to produce a gas of given calorific value would not be in such excess as was used for the experiments. Thus the consumption of fuel for the raising and subsequent superheating of the steam would be more favourable for economical working.

DESCRIPTION OF A CARBONIZING PLANT FOR SHALE.

A method for the carbonization of the shale is embodied in a

TABLE IV.—*Distillation of Shale and Cracking of Volatile Products in Presence of Steam.*

Experiment No.	Temperature of Superheater. ° C.	Cubic Feet Gas per Ton. 60° Fahr. 30 Ins.	Gross Calorific Value B.Th.U. Cubic Feet 60° Fahr. 30 Ins.	Specific Gravity.	Tar Per Cent.
7	980	35,800	636	0·52	5·1
8	1000	40,800	582	0·52	2·9
9	,,	45,600	532	0·51	1·2
10	,,	56,100	441	0·44	2·6
11	,,	52,300	487	0·48	0 3
12	1200	77,500	346	0·45	..

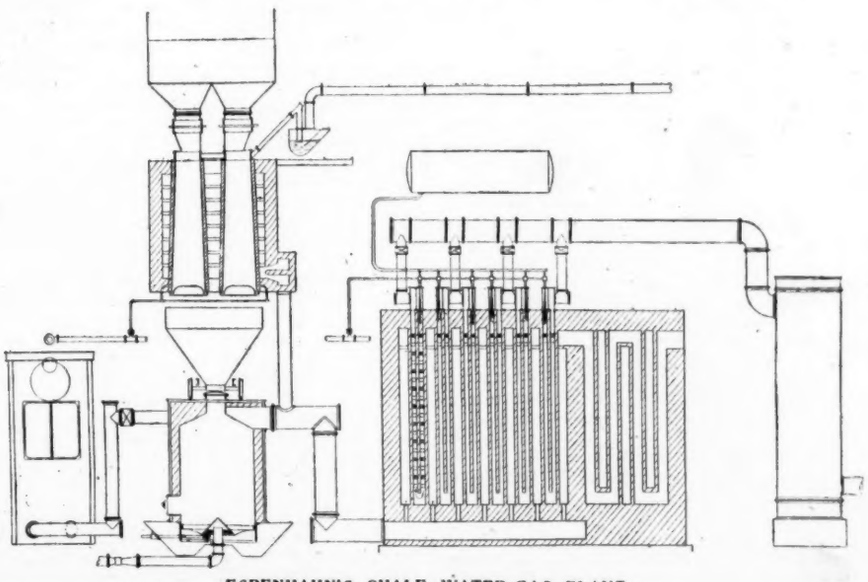
Experiment No.	Composition of Gas, per Cent.					
	CO_2	C_nH_m	CO	H_2	CH_4	N_2
7	2·87	13·39	16·45	45·10	20·75	1·46
8	3 14	13·01	17·93	45·10	16·62	4·20
9	3·30	8·76	21·20	48·16	15·60	2·98
10	3·05	2·67	19·19	59·32	12·74	3·03
11	4·05	6·55	21·00	51·36	13·26	3·58
12	9·04	1·21	17·99	61·67	7·13	2·96

plan of the author. The crushed shale is delivered into hoppers, and is fed into the series of vertical retorts. The shale, being non-caking, passes through with little resistance, and is withdrawn at intervals into the lower bunkers, from which again it is supplied to the generator. This is of the revolving grate type, with air-blast, whereby the formation of clinker and waste of fuel through incomplete combustion of the coke is prevented. A constant bed of fuel can be maintained by means of sight-holes. The producer gas, after meeting the preheated secondary air, passes through heating flues (forming the superheater), which are maintained at any desired temperature. Part of the producer gases serve for distilling the mineral in the retorts, which are heated in the lower section to 700° to 850° C. The sensible heat of the remainder is taken up in the regenerator for preheating the secondary air.

Steam is admitted into the retorts below the hottest zone, thereby preventing the decomposition of the oil vapours and assisting the formation of ammonia. With oil shales a higher percentage of the nitrogen is recovered in the form of this bye-product than from bituminous coals or destructive distillation, although it is characteristic of the Australian torbanite that the nitrogen content decreases with the falling percentage of volatile matter, in contrast with the Scotch oil shales, which hence yield more sulphate of ammonia. The permanent gases, on leaving the retorts, are separated from the oils, condensed at lower temperatures, and are treated for the recovery of sulphate of ammonia—preferably by absorption direct with sulphuric acid.

From a reservoir, the oil is fed with the proportion of steam into the superheater, where its fixation into permanent gases occurs. Travelling through the reaction flues, the gases are checkered, so that a greater surface is offered during their passage. The recovery of the waste heat contained in the gases and excess of steam is effected in condensers, the water of which is fed into the boilers, under which any excess of producer gas is burnt. The permanent gases formed in the first instance are passed with the oil into the superheater, or they may be used for carburetting the oil water gas.

The author is not aware of any attempts to utilize the mineral itself as fuel in the form of producer gas. The simple form of



ESPENHAHN'S SHALE WATER-GAS PLANT.

producer would not lend itself for this purpose, as distillation of the mineral would result, and a large proportion of the calorific power be lost as tar carried forward by the gas. The conversion of the total calories including the volatile products into permanent gases would be effected by using the twin form of producer.

The utilization of all grades of the mineral by this means, however, would not prove economical, nor does the author consider it possible, as in the case of the first-class shale the fixed carbon would probably not suffice for the maintenance of a combustion zone. With shales containing less than 60 per cent. of volatile matter, the ratio $\frac{\text{F.C.}}{\text{V.M.}}$ is considerably higher; so that, in spite of an ash content of 50 per cent., the calorific value of a mineral with 35 per cent. of volatile matter could be made available in the form of producer gas. The Scotch shales with a falling percentage of volatile matter maintain a constant ratio $\frac{\text{F.C.}}{\text{V.M.}}$, in which they differ from the Australian mineral. Thus the former, with the same proportion of volatile matter, contain a considerably higher percentage of ash. This factor would probably preclude their use for gaseous firing without taking into consideration the economic value of the mineral for the production of oil.

POWER WITH BYE-PRODUCT RECOVERY.

In an article dealing with gas-fired boilers for electricity generating stations, contributed to the current issue of the "Engineer," Mr. T. R. Wollaston says that it is generally accepted that coal prices will never again fall to the level of ten years ago, when it was possible for a few enlightened and enterprising firms to obtain all the power they required for nothing; the coal bye-products obtained exceeding in value the total running, labour, and capital charges on the plant employed. Coal of quite good producer quality could be purchased at 6s. per ton delivered at the works; and from every ton could be obtained about 90 lbs. of sulphate of ammonia, worth 9s. 6d. The difference—3s. 6d.—was found to easily cover running and capital charges. With coal at higher prices, the average rebate of 6s. per ton would still probably remain upon a resumption of normal industrial conditions. One is often asked, "Will the demand for, and the price of, sulphate of ammonia be maintained?" The first of these questions can be confidently answered in the affirmative. The value of sulphate for manurial purposes alone is only beginning to be realized in those countries which need it most; and shipments from this country and Germany for the few years prior to the war showed steady, rapid increase. With regard to the second question, practically all the production is at present obtained from coal. Other sources of production are frequently discussed—the most interesting being, of course, the fixing of atmospheric nitrogen. But after frequent communication with commercial and scientific authorities, one does not see the possibility of these having any important influence on prices for many years to come. The average prices per ton between 1900 and to-day have been reasonably in sympathy with coal values, and so, it is submitted, they are likely to continue.

The universal ideal for future power generation seems to be the installation of economical generating plants in cheap fuel localities and electrical distribution; and the typical modern station is one containing large steam-turbine units, few in number, taking steam from water-tube boilers, and surface condensing. Accepting these facts, and assuming a station with a maximum output capacity of 15,000 units, or 20,000 H.P., with a load factor of 25 per cent., the author proceeds: (1) Coal-fired boilers, working at 70 per cent. average efficiency, will consume 2 lbs. of coal per horse-power-hour, including banking and standby. (2) Gas-fired boilers will work at 83 per cent. efficiency, calculated on coal gas value. This result is consistently obtained on boilers of ordinary type converted for gas firing. Better results may be expected as special types develop. (3) Recovery gas-producers will, using common slack, work at 68 per cent. cold-gas efficiency—yielding sulphate of ammonia equal to 4 per cent. by weight of the coal gasified, and generating their own blast steam. The last condition remains to be demonstrated on the large scale, but is clearly practicable. (4) The gas plant, to secure the above efficiency, must be worked continuously at or near full load. The obvious conclusion from (4) is that gas firing should only be adopted for the average load factor—*i.e.*, 5000 H.P.

The only radical modification from orthodox procedure inside the station would be the adaptation of one-quarter of the boilers for gas firing or the installation of special gas-fired boilers to this extent. This modification, if it affected capital outlay and labour charges at all, would tend to reduce them; so, for simplicity, capital charges and labour on all but extra plant are ignored. The extra plant—the recovery gas plant and mains—involves charges which can only be approximated, but which, averaged from a large amount of data in the writer's possession, may be reasonably taken as: Extra capital outlay, £22,500; extra labour on plant, £2100 per annum; extra stores, £700 per annum.

Calculating on the facts and figures set forth, Mr. Wollaston produces a result which, he says, indicates that the adoption of gas-firing should show a saving of something like £13,000 per annum on running costs, representing at least 50 per cent. return on added capital outlay, with coal costing 15s. and sulphate at £15 per ton. With coal at 15s. per ton and sulphate at £8 per ton, no advantage would accrue. On the other hand, with coal at 10s. and sulphate selling at £18 10s. per ton—by no means impossible future rates—the extra capital outlay would be recouped in about twelve months.

It will, the author concludes, no doubt be suggested that the average load, 5000 H.P., is treated as if it were a steady one, whereas in reality it is the mean of a ragged load curve generally showing sharp peaks and depressions. This is true so far as the generators and boilers are concerned; but it should not be difficult to maintain a dead steady load on the gas plant by the simple expedient of fitting some of the coal-fired boilers with supplementary gas-burners—a proccdure which need in no way interfere with the operation of ordinary furnaces. So long as the load on the station is below the average, the surplus gas is utilized for keeping the idle boilers hot and ready for immediate steaming as the peaks come on. All experience goes to prove that this method is both flexible and convenient.

GAS-MAINS AND THE NEW RAPID TRANSIT SUBWAY IN NEW YORK.

Subsurface congestion, brought about by the number of mains and conduits underlying the principal thoroughfares in New York, has now reached an acute stage. Prominent attention has been attracted to the subject by the construction of rapid transit subways on an extensive scale (with a view of relieving surface traffic), which has been in progress the last two or three years, under the superintendence of Mr. C. N. Green, the Engineer of Subsurface Structures for the First District Public Commission. [See "JOURNAL," Vol. LXXIX., p. 30.]

Mr. Green, in the course of recent communications to the "American Gas Light Journal," states that the laying of underground mains in the streets has been left almost entirely to the control of the owning companies, and has been conducted independently and indiscriminately, without any systematic plan or assignment of space; and that the condition has been steadily changing for the worse during the last fifteen years, on account of the introduction of new and additional lines, necessitated by the requirements of modern civilization. The older structures have been replaced by larger sizes from time to time, or reinforced by a second line; and now the addition of subways for further transport facilities reduces the available subsoil space, and renders it very difficult to provide adequate accommodation for existing utilities, to say nothing about leaving room for any probable future requirements. Not only have structures been laid independently, but there is much duplication as a result of competition. In some streets there are as many as twelve distinct lines of gas-mains, owned by four different gas companies, and frequently three or more, ranging up to 20 inches in diameter, all the property of one undertaking. The pipes are not laid in straight runs, but are offset back and forth, from one side of the street to the other, without any consideration as to economical use of space. Out of 1450 miles run of gas-mains in Manhattan, which average three lines per run of street, only 200 miles are larger than 12 inches in diameter, and a considerable proportion of them might be classed as service mains. Many buildings are connected up to all the competing gas-mains in the same street.

There is also the question of street openings, 60 per cent. of which are in connection with services. These necessitate breaking up the paving or other made surface and digging trenches, which it is almost impossible to refill properly and in such manner as to restore the surface to its original condition. There is always some degree of settlement, leaving the surface in a condition very dangerous to traffic. The number of permits granted for this purpose in 1913 was 7166 for foot walks and 19,567 for roadways. Of these, 8158 were for gas-mains, inclusive of 7192 for repairs to gas mains and services and for overhauling 42,690 feet run of mains. In 1912, the area of smooth paving restored by the gas companies was more than 66,000 square yards, and probably an equal extent of stone block paving was similarly restored. The average amount of maintenance charges for the gas companies operating in Manhattan was $516 per mile per annum; while in other districts of New York, the corresponding figures were $200 and $300, showing very clearly that the congested condition of the subsurface largely increased the cost of maintenance by the gas companies.

There was room for the removal of all duplicating lines, and for a less expensive and less cumbersome method of maintenance and operation. All structures not in actual use should be removed by the owning company. The results would be a better condition of the footway and road surfaces, less interference with business and traffic, fewer complaints, less loss and nuisance by leakage, and easier and cheaper repairs. Pneumatic mail tubes, steam-pipes, electric conduits, and high-pressure fire service were fairly modern additions to subsoil utilities; and from time to time it was probable that other such like conveniences would be added, further encroaching on the underground space. That some of these duplicate gas-mains were useless was proved by the fact that, although in the course of the subway construction they had all been cut off and the usual service supplied, sometimes for a period of three years, by means of the two gutter mains (one on each side of the road), no complaints as to shortage of gas supply

had reached the Commission. At present, they were incurring excessive costs in the restoration of useless mains, and that without benefit to any of the parties concerned. This position of affairs was not peculiar to New York, but also prevailed in Boston, Chicago, and other large cities.

As might be expected, the Editor of the "American Gas Light Journal" dissents strongly from the statement that it is impossible to refill street openings in such a manner as to avoid all future trouble. He maintains that, after a reasonable period for settlement, the opening can be covered in and left in a condition that will ensure a firm and durable subsurface foundation and no further settlement or disturbance of the surface, and that the unfortunate experiences in New York can be attributed to causes for which the Highway Department are almost invariably responsible. The methods of carrying out a refill in an efficient manner are stated in detail. When a refill is completed, sufficient time for thorough drying out should be allowed before traffic is permitted on the newly-made ground. When the usual conditions are resumed, further settlement may result, and the place should then be levelled-up with hard stone or broken concrete at regular intervals. This can be continued for several months if necessary, without serious inconvenience or danger to the traffic, before the permanent surface covering is replaced. But in New York the permits for openings on the public roads were conditional on the payment of an arbitrary restoration price per square yard—in one instance at least, nearly three times a fair sum was charged—and the highway authorities carried out the refilling and restoration. They did not use sufficient water on the job, and were in too much of a hurry to restore the original surface covering. If the gas companies were allowed to see the opening through to the end, and were held responsible for a proper restoration of the surface, not only would the expense be less but the result would be more satisfactory all round.

The new subway is rectangular in cross section, and wide enough to accommodate four lines of rail traffic—the centre pair for express, and the side ones for local service. It may either lay inside the space between curbs, or extend under the footwalks on each side. The rail level ranges from 19 to 23 feet below that of the roadway above; and as 15 feet clearance is allowed above the rails, a depth varying from 4 to 8 feet is left for the roofing and cover. The stations are situated at crossings, and the excavation for their accommodation is carried under the side streets. The usual type of construction includes transverse steel I section girders spanning the entire width, spaced 5 feet apart, with concrete filling between, carried on I upright girders at each end, and further supported by intermediate standards between each line of rails. The space between the upper parts of the side bearers is also filled in with jack arches of concrete, and joined in to the roof filling, so as to form a continuous structure of steel and concrete.

The most economical method of construction is that known as "cut and cover;" a trench being excavated for the full width and depth required, the structure erected, and the remainder of the trench back-filled to the surface of the road. Where vehicular traffic is limited, the construction may proceed by the open trench method; but in busier districts, where the street traffic must not be stopped or interfered with, a temporary wooden decking is erected over the excavation. In either case all the underground mains and conduits in the line of excavation are exposed and underpinned, and must either be supported temporarily or else removed and subsequently replaced. Arrangements were also made for permitting temporary access to manholes or valves, and for moving into a new position any lines coming within the area occupied by the subway. As soon as the whole of the subsurface mains, &c., were exposed by the progress of the excavation, accurate plans were prepared, showing the several dimensions, locations, depth below the road surface, and all other necessary details; and, so far as circumstances would permit, these were used as a guide for the restoration.

The space commonly occupied by the gas-mains in the roads is situated mid-way between the trolley lines at the centre and the curb; and the customary depth of cover for gas and water mains is 4 feet. In many cases they can be lifted to a sufficient extent to clear the subway roof and at the same time retain 2 feet of cover; but, whenever possible, a cover of not less than 3 feet is maintained. Sometimes the only available course is to remove the mains from the roadway, and replace them under the side walk; but this position for the mains is not preferred. Difficulties arise in connection with the run of the mains and the drip boxes; and it is not considered good practice to place these under the footwalk, with a service connection to the main in the road. A preferable plan is to rearrange the run of the pipe in such a manner as to convey the condensed liquids into the mains in the side streets. As the made-up ground above the subway roof may be expected to settle to a considerable extent in the course of time, all mains situated in this position are supported from the roof by pillars or packing. All sorts of saddle-pieces, curves, or lengths of shallow rectangular box mains have been specially devised as a means of passing obstacles and getting through tight places; and sometimes "manifolding," or substituting several small pipes in the place of a large one, must be resorted to. In this connection, wrought-iron or steel pipes and oxy-acetylene welding have been freely utilized.

The number of public lamps in the City of Birmingham at the end of the past financial year was 18,138, and of court lamps 4101; but only 2855 lamps out of the total of 22,239 are now lighted.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Contractors "Agents" or Engineers.

SIR,—Joking apart, you can hardly seriously have so entirely misconstrued my observations at the Wandsworth Gas Company's recent meeting.

Your readers will quite see that they apply to the monstrous statements of your correspondents, who say the gas engineers do not design, but put a block plan into the hands of a favoured contractor. It is further supported by an engineer, who excepts himself but charges his fellows with adopting these plans as their own; so deceiving their clients and employers, and preventing an honest competition for the work. These letters are followed, naturally enough, by the suggestion of the Secretary of the Society for the Prevention of Corrupt Practices, as to the need for all the engineers and contractors to become members of the Society, and so purge themselves.

I believe more unfounded and unwarrantable charges were never before made openly against what my experience leads me to believe and hope to be an honourable and righteous profession; and I have been waiting week by week for a disclaimer of the corrupt and dishonest practices your two correspondents so baldly and directly impute.

Palace Chambers, Westminster, HY. E. JONES.
Aug. 23, 1916.

[No comment on the above "explanation" need be offered.—ED. J.G.L.]

REGISTER OF PATENTS.

Distillation of Heavy Oils, &c.

HALL, W. A., of Gracechurch Street, E.C.

No. 8836; June 15, 1915.

This invention relates to a process of distilling bituminous oils—more particularly to an improvement in the process described in patent No. 4598 of 1915.

In accordance with the earlier invention, the distillation of bituminous oils is effected in a manner whereby substantially all of the volatile portions are separated from the non-volatile and condensed—the condensate being of an entirely different character from the original oil, and of much greater value. That process referred to a distillation without fractionation from a mass of oil placed in a still or retort and admixed with a sufficient amount of porous coke to produce (before starting the distilling operation) a semi-dry mass. It has been discovered by the patentee that, under such conditions, substantially all portions of the distillate come over of the same character as any single portion—*i.e.*, the first 25 per cent. of the distillate being fractionated is found to be substantially the same as the second, third, and fourth quarters, as opposed to the general condition of distillation, wherein the lower boiling fractions come over first and are succeeded continually by the higher boiling fractions. This difference from ordinary distillation has led the inventor to term it "distillation without fractionation," or "distillation without accord to the boiling points."

When this process is practised, starting with a thick viscous bituminous oil, such as the crude oils of Mexico or their heavy distillates or residues, which may be still bottoms or even solid asphaltum (bitumen) with gravities approximating to, or in excess of, that of water, a thin limpid oil is obtained of from ·845 to ·895 sp. gr., which does not materially thicken or congeal even at 0° C. In practising the process, the heavy bituminous oil is first heated to render it thin, and is then mixed with a sufficiency of coke to produce a semi-dry mass; and this mass is then retorted or distilled, giving a yield of oil from 75 to 85 per cent. in volume of the total amount treated, the balance (15 to 25 per cent.) being substantially all dry coke and being left in the retort. The process can be economically practised where fuel is inexpensive; but as from two to three parts of coke are required to one part of oil, from two to three parts of extraneous material must be heated to each part of oil, and the process is intermittent and requires the cleaning of the still or retort when the operation is completed.

Another objection is the great difficulty of imparting heat from external sources through the heavy mass of oil saturated coke, which acts as a non-conductor or insulator of heat, requiring considerably small spacings in order that the heat may pass with sufficient rapidity to the centre of the mass. Thus comparatively small diameter retorts are required.

These disadvantages are said to be largely overcome by the process forming the subject of the present invention, which consists broadly in mixing the oil with an amount of coke or like porous combustible material at least equal in weight to the amount of oil, and subjecting the mixture to direct contact with hot gases of a non-oxidizing character, and condensing the volatile matter evolved by the reaction—the heat necessary for effecting this distillation without fractionation of the bituminous oil being obtained by the combustion of a portion of the coke itself; the oil being brought into contact with the coke and the distillation effected at a point above the combustion zone where the products of combustion have acquired a non-oxidizing character.

Burners for Combustible Fluid Mixtures.

PEASE, E. L., of Darlington.

No. 10,766; July 24, 1915.

This invention relates to fluid combustion burners suitable for furnaces, comprising mutually adjacent separate passages for the combustible fluid and for air formed by parallel plates or laminæ having all the

inlets of the passages for one fluid arranged on one side of the burner and those for the other fluid on its opposite side, and the fluids caused to separately emerge in flat mutually contiguous streams. Such constructions are said by the patentee to be advantageous when the respective fluids are delivered at different temperatures, because of the relatively large surface that can act as heat-exchanging means.

By reason of the comparative narrowness of the passages, and in some cases their number, it is regarded as desirable to reduce to a minimum frictional or other hindrance to a free and uniform passage of the fluids through them, so that the maximum of the efficiency of the burner can be obtained. For effecting the first of these objects according to the present invention, a burner of the kind referred to, having the inlets on the one side for combustible fluid and on the other for air, is provided with ducts or passages in alignment with the inlet portions of the passages constituted by the plates—thus obviating any abrupt change of direction in the oncoming fluid.

Automatically Extinguishing Gas-Lamps.

LAW, J. R. K., of Glasgow.

No. 14,339; Oct. 11, 1915.

This device for automatically extinguishing gas-lamps on an increase of gas pressure consists of a pulley or wheel applied to, or connected with, the usual gas-cock; the pulley having, in its periphery, a recess with which a fulcrumed lever catch is caused to engage automatically by the pressure of the gas.

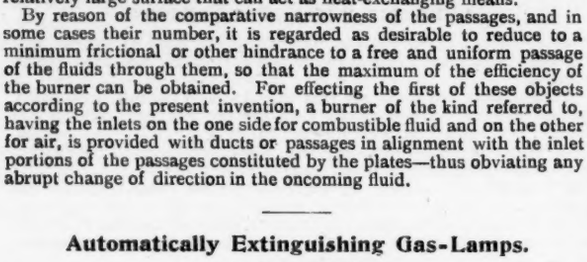


Fig. 1. Fig. 2. Fig. 3.

Law's Automatic Lamp Lighter and Extinguisher.

Fig. 1 is a vertical section of the device as it appears when the gas is turned on. Fig. 2 is a front elevation. Fig. 3 shows the parts as they appear when the gas is turned off.

As shown, the pulley or wheel D is keyed on the spindle C of the gas-cock B, and has, in its periphery, a recess E with which a lever catch F, fulcrumed at G, engages automatically by the pressure of the gas in the pipe A. To enable this to be done, the lever catch, at its lower end, is so connected to a diaphragm H as to move with it. The diaphragm forms one side of a cylindrical box I secured to the gas-pipe and communicates with the interior by a passage J, so that the diaphragm is, at all times, exposed at its inner side to the action of the gas. A torsion spring K on the spindle always tends to close the cock. In conjunction with the wheel D is a drum L, from which a chain hangs down freely to an extent sufficient to enable it to be reached by the lamplighter.

To extinguish the lamp the pressure of the gas is momentarily increased, and, as a result, it acts upon the diaphragm H as shown in fig. 3, and moves the lever catch (previously engaged in the recess E of the wheel D) so as to free the wheel and allow the spring K to turn the cock automatically to the closed position. During the time the cock is closed, the point of the lever catch F rests against the side of the wheel and is free of its recess. But when it is desired to turn-on the gas, the chain is pulled, with the result that the wheel is caused to revolve (against the action of the spring) until the recess E comes opposite the catch, when the latter immediately engages the recess under the action of the resiliency of the diaphragm, or of a spring provided for the purpose. The wheel is now locked in the open position (as in fig. 1) and so remains until the gas pressure is again momentarily increased beyond the normal and forces the diaphragm outwards and causes the lever catch to free the wheel D, when the spring again acts to rotate the cock and close it.

Gas-Stoves.

DAVIS, H. N., and TWIGG, W. R., of Luton.

No. 14,970; Oct. 22, 1915.

This invention relates to gas-heated cooking stoves or ovens of the kind provided with double walls or flues through which the incoming air is adapted to pass to the burners—first, in an upward direction at the back of the oven, then over the top and down the two sides to the burners; the air being heated by contact with the oven-heated flues and also by causing the escaping products of combustion to pass down and up in a trap or flue disposed behind the first up-take flue.

According to the chief constructional features of this invention, the hot waste gases are caused to pass through a trap arranged wholly within the up-take flue at the back of the stove, and the burner tubes are arranged in open-sided casings disposed along the bottom of the sides of the stove, so that the heated air is directed on to the flames.

The patentees claim: (1) A stove having means for supplying heated air to the burners comprising in combination an upward flue at the back of the stove for the admission of cold air, downward flues at the sides of the stove forming a continuation of the upward flue and leading to the burners, and a trap for the exhaust gases arranged wholly within the uptake flue for inducing a circulation of air through the flues. (2) A stove in which the heated air from each of the downward flues is admitted to the burners through an open-sided casing within which the burners are arranged, so that the heated air is directed on to the flames.

Regulating Devices for Gas-Burners—No. 100,926.

WINN, P., of Birmingham, and WILKES, A. H., of Sutton Coldfield.

No. 1294; Jan. 27, 1916.

This invention refers to the type of burner regulator in which a plunger with a flat end is adjusted across a gas-passage the opposite wall of which is a smooth unbroken surface. The proposal is to employ, in combination the flat-ended plunger at least as large in diameter as the gas-way with plain cylindrical surfaces at its operative part, a smooth unbroken gas-way, and a stop limiting the movement of the plunger so that, when restricting the passage to its full extent, a D-shaped opening for the passage of gas is left.

The plunger valve is simply closed and opened by a forward and backward movement, or may slide by a crank or lever attachment. The preferred arrangement is a screw thread for its adjustment, "as being more sensitive and admitting of a nicer adjustment." A tapped passage is arranged for the screwed part of the plunger as a channel open at the top to expose part of the threaded portion of the plunger. This prevents seizure of the threads that is "liable to occur with screws after long use under considerable heat." The desired result may be attained by cutting away part of the thread on the valve plunger instead of the tapped passage in the body of the injector; and it may be desirable, when employing high-pressure or any of the more penetrating gases, to use a complete circular thread in both the injector and the valve.

An adjustable stop to prevent the end of the plunger impinging on the walls of the orifice forms a part of the construction described; the object being to prevent deformation of the shape of the orifice or end of the valve, which is liable to cause deflection of the gas stream.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 23.]

Nos. 11,437—11,812.

ADAM, H. C.—"Indirect and semi-indirect lighting fixtures." No. 11,661.

BARRETT, M.—"Preventing disintegration of refractory materials." No. 11,751.

CREASEY, H. H.—"Incinerator or refuse destructor for domestic use." No. 11,761.

DAVIES, L. L.—"Treatment of pitch, &c." No. 11,551.

DAVIS GAS-STOVE COMPANY.—See Creasey. No. 11,761.

FENWICK, J. B.—"Hydraulic mains." No. 11,510.

LIQUID PURIFICATION COMPANY.—"Production of sulphite and sulphate of ammonia from gases and ammoniacal liquids." No. 11,498.

LYMN, A. H.—"Gas-producer plants." No. 11,471.

POORE, P.—"Carbonization of wood, &c." No. 11,759.

RAMBUSH, N. E.—See Lymn. No. 11,471.

RIEDEL, A.—"Method for preventing choking-up of gas plant." No. 11,574.

RIEDEL, A.—"Operating gas-generators." No. 11,575.

RILEY, L. A.—See Lymn. No. 11,471.

SEYMOUR, H. W.—See Liquid Purification Company. No. 11,498.

TILLEY, F. C.—"Gas-heated soldering iron." No. 11,662.

WERNER, E. M.—"Indicating volumetric flow of gases." No. 11,473.

WILSON, W.—"Still for extracting benzol, toluol, &c., from oil." No. 11,654.

New Works for the Water Supply of Topsham.

At a cost of from £5000 to £6000 a new water supply for Topsham (Devon) has been completed, after half-a-century's agitation as to whether or not the surface water well supply was not adequate for the district. The new supply is obtained from the red sandstone; the site of the well and pumping station being near the main Exeter road. The well, which is lined, has a diameter of 8 feet and a depth of 61 feet. From the bottom of the well is a bore-hole, which goes down another 130 feet—giving a total depth of 191 feet. A fourteen day and night trial made before the well was constructed showed an average continuous yield of 120,000 gallons per 24 hours without exhausting the bore-hole. The water is lifted by three-throw pumps, driven by oil-engines, to a water-tower about three-quarters of a mile away. The engines and pumps are in duplicate; each set being specified to lift 5000 gallons per hour. The lift from the pumping-house floor to the tower is about 100 feet. The tower consists of a circular tank, with a capacity of 50,000 gallons, on an octagonal base and eight pillars—the two storeys providing storage for fittings, valves, &c. The tank is high enough to constantly supply tanks in the roof of any house in the parish. Mains (the smallest 3 inches diameter) are laid through every street, and provided with valves and fire hydrants. The pressure throughout the greater part of the parish is sufficient to throw water without assistance over the tops of the houses. The works were designed by Mr. Sidney R. Lowcock, M.Inst.C.E., M.I.Mech.E., who has been assisted by Mr. F. E. Simpson, the Resident Engineer. The Local Government Board sanctioned a loan for the work before the outbreak of war, repayable in thirty years.

Price of Gas at Ashton-in-Makerfield.—Estimates of the increased expenditure on the gas undertaking for the year to March 31 next showing a probable loss of £1000, the Ashton-in-Makerfield Urban District Council have resolved to increase the price of gas 5d. per 1000 cubic feet from the end of this quarter. It has also been decided that the purchase of further new cookers to be let out on the hire-purchase system be suspended.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Municipal Savings Banks Act.

The Municipal Savings Banks (War Loan Investment) Bill (No. 2) received the Royal Assent on Wednesday.

Coal Prices (Scotland).

Mr. PRINGLE, on Monday last week, asked the President of the Board of Trade whether any application had been received from the Scottish coalowners for an increase in the standard amount allowed by the Price of Coal (Limitation) Act, 1915; whether, before dealing with such application, he would take steps to check the evasions of the Act of which complaint had been made to the Board of Trade; and whether, before coming to a decision, he would consult representatives of the consumers?

Mr. PRETYMAN replied that no application had been received for an increase of the standard amount as respects collieries in Scotland.

Sulphate of Ammonia.

Mr. PETO inquired of the Parliamentary Secretary to the Board of Agriculture whether he was aware that farmers were experiencing difficulty in obtaining supplies of sulphate of ammonia on the terms recently announced by the Board as having been offered by sulphate of ammonia makers; and what action the Government proposed to take in the matter?

Mr. ACLAND made the following reply: The Board have heard of a few cases of difficulty, and will be very glad to investigate any that are brought to their notice, if particulars of the quantity of sulphate of ammonia required, and the name of the producer or dealer to whom application was made, and the date when it was made, are sent to the Secretary of the Fertilizers' Committee. The Board have no reason to think that the arrangement accepted by the sulphate of ammonia makers, under which farmers will be able to obtain sulphate of ammonia at reasonable prices, is not being observed; but they would be bound to consider what action could properly be taken if it were found that makers were not allowing a fair proportion of their make to be used for agricultural purposes on the terms recommended.

Defence of the Realm Act (Position of Contractors).

Mr. PETO asked the Prime Minister whether his attention had been called to the judgment in the case of the Metropolitan Water Board *v.* Dick, Kerr, and Co, in which the decision of the Court was that a contract was not determined by action taken by the Ministry of Munitions which rendered it impossible to continue its execution; and whether he intended to introduce legislation to define the position of contractors under conditions that were brought about by the Defence of the Realm Act and other exceptional legislation necessitated by the war?

The PRIME MINISTER stated that the question was under consideration. A deputation representing certain contractors had been received, and further information was now being obtained with a view to an early decision on the matter.

COWLYD WATER BOARD BILL PASSED.

Introduced into Parliament as a late Bill at the beginning of June last, the scheme of the Conway and Colwyn Bay Joint Water Supply Board has passed through both Houses in very quick time.

The Cowlyd Water Board was established in 1892 for the acquisition of Lake Cowlyd, between Trefriw and Capel Curig, for the supply of water to certain parishes of the Conway and Glan Conway rural districts, to the district of the Conway Corporation, and to the area of the Colwyn Bay Urban Council. One of the terms on which the lake was purchased was that a regular supply of water should be maintained down the River Afon Ddu, from the lake to the River Conway, the daily measure of the water being then fixed at 1,552,500 gallons. The watershed immediately surrounding the lake has at all times given off an ample supply of water to fill the lake; but the ever-increasing need of the extensive district of the Joint Board necessitated a much larger supply than had at first been anticipated, and the original water-mains have accordingly had to be replaced by mains of much larger dimensions. The establishment at Dolgarrog of the Aluminium Corporation works resulted in that Corporation proposing to the Cowlyd Board that the Board should allow them greatly to increase the capacity of the present lake by building a dam some 600 feet below the present one, and adding the intervening space to the size of the present lake, the geographical position of which is peculiarly adapted to the accumulation of water not only from the Board's present watershed, but also, and to a much greater extent, from a very considerable area of adjoining property, much of which belongs to the Corporation. Negotiations followed which materialized in an agreement between the Board and the Corporation, the terms of which were given in the "JOURNAL" for June 27, p. 699.

By this agreement, the Corporation undertake themselves to carry out the whole of the works necessary to build the new dam and acquire all the requisite property to enable them to do so, and when completed will hand over and vest in the Board the whole of the new works, and will maintain them free of cost to the Board in the future. They will surrender the whole of the compensation water to which they are entitled from the Board, and will indemnify them against the supply of such water to riparian owners on the Afon Ddu, or to anybody else entitled to, or interested in, such water, and will pay the costs of the Board in acquiring the necessary statutory powers to carry out the terms of the agreement.

It is anticipated that by the new arrangement a plentiful supply of water to the whole of the district of the Joint Board will be permanently ensured.

MISCELLANEOUS NEWS.

CROYDON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the Offices, Katherine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair. In the meeting room, a striking photograph of the late Sir Corbet Woodall was hung for the inspection of the proprietors. In future, it will have a place on one of the walls of the Board room.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

THE LATE SIR CORBET WOODALL.

The CHAIRMAN said that, before proposing the first resolution, he must ask the kind indulgence of the proprietors for a few minutes, while he referred, as he was sure they would wish him to do, to the sad loss the Company had sustained, since they last met, by the death of their esteemed colleague and friend, Sir Corbet Woodall. For 22 years, he had been a Director of the Company. During the whole of this time, he (the Chairman) had had the pleasure and privilege of sitting next to him at the Board of Directors; and his charming manner and personality he always fully appreciated. During these 22 years of service, many important events had taken place in connection with the Company. Although Sir Corbet was not on the directorate when the amalgamation with the Carshalton Company took place, he was then, strange to say, advising the Corporation with regard to the Company's Bill—the Corporation, of course, being in opposition. The members of the Board admired him then for his fairness in respect of the course that he advised the Corporation to take. In the following year, on the retirement of Mr. Hyslop (who, he believed, held the record for being the only Director of the Company who ever retired), and partly on his advice, the Board decided that, in his place, they would elect a gas engineer of some eminence. Their choice then could certainly not have been of a happier nature than it was; for during the whole of the time since—during the amalgamation of the Caterham Company and also, from among circumstances which he (the Chairman) remembered out of many, during the quinquennial valuation of the Company's plant, mains, and stock, Sir Corbet rendered signal service. He did not hesitate to say that he saved the Company a large amount of money by his sound advice, judgment, and practical experience, all of which he brought to bear upon these matters. Sir Corbet was also most cheerful; and he had heard him say, on more than one occasion, that he always liked attending their meetings at Croydon more than he did those of any other company with which he was associated. He was connected with a great many companies; and the information and experience that he gained—both parliamentary and through his association with the other companies as a Director—was of the greatest possible service to the Croydon Company. He (the Chairman) did not think if he spoke for an hour, he could convey to the proprietors any more than the deepest respect and reverence in which they held his memory. He was sure it would be the wish of the proprietors that a letter should be written to Lady Woodall, and the members of the family, expressing their great regret at the loss the Company had sustained by the death of Sir Corbet, and their deepest sympathy with them in their sad bereavement. ["Hear, hear."]

THE NEW DIRECTOR.

The Directors had to consider the filling of the vacancy on the Board. They were very strongly of opinion that the vacancy should be filled by a gas engineer of some eminence. Fortunately for them, Sir Corbet had a son who had been associated with him for many years, and who had had a great deal of experience in his father's office. He had this to recommend him. To save Sir Corbet Woodall's time (which he so generously gave to the Company), the Directors had many discussions on important points at his office in London; and therefore Mr. Henry Woodall became acquainted to a very large extent with what was going on in the Company and at their works. This was an advantage. Not only this, but Mr. Woodall, besides the extensive experience he had with his father, was associated with several other gas companies; and he believed he was right in saying that he possessed one or two small gas-works of his own. His experience should therefore be of great service to the Company. Having appointed Mr. Woodall to succeed his father, he was sure they would never regret the step they had taken. He had already shown himself conversant with the Company's Acts of Parliament, and the working of the Company. He (the Chairman) was sure that the Board would have the approval of the proprietors in having made the appointment. Of course, Mr. Woodall would come up for re-election when the time expired when Sir Corbet would, had he remained with them, have come forward for re-election.

EFFECTS OF THE WAR ON COAL AND OIL PRICES.

He had now to move the adoption of the Directors' report and the accounts; and, in doing so, he would deal with the working of the half year, and give a sketch of what would, so far as they could forecast, be the experience in the current six months. During the half year, their history had been in its main financial aspects comparatively uneventful. The general rise in values of commodities throughout the country was reflected in the revenue account, which was greater on both sides—the total revenue amounting to £179,000, as compared with £154,000, or upwards of 16 per cent. more, while the increase in the quantity of gas sold was slightly under 3 per cent. The gross profit was £1700 more; being £30,300, compared with £28,600. As, however, he pointed out last February, they had to look forward a little to appreciate fully the effect of the war on their financial working; and they would be able to see matters in a truer light if, abandoning for the moment the usual practice of making comparisons with the preceding year, they looked at the effect of the prices which would probably govern their working during the coming twelve months, as compared

with what he might term pre-war conditions, or the prices which—but for the war—would have ruled during the year which commenced in the month of July, 1914. As the materials representing the greater part of their purchases—coal and oil—were bought under contracts covering a period of twelve months, they were now in a position to estimate, with a fair approximation to accuracy, what the war really had meant to the Company, and through it to the consumers. The governing factor was that of freights; for, while coal at the pit's mouth fetched a price considerably higher than before the war, some attempts at interference with the free play of the law of supply and demand had been made by legislative action. This action had been far from securing all the objects aimed at, as, indeed, might be expected where the demand of buyers was for an article of which it was necessary they should obtain a certain quantity, and of which the sources of supply were limited and insufficient to meet the demands made upon them. Still, f.o.b. prices of coal had undoubtedly been kept by Government action from rising to the full extent they otherwise would have done. In the matter of freights, however, there had been practically no such moderating factor. Rightly or wrongly, the Government had not ventured on any policy of control in regard to these; and they had risen to rates which, after every allowance was made for increased working costs, showed a profit to shipowners on such a scale as tended to arouse a feeling of very natural resentment among those on whom the war had imposed heavy financial burdens. The result of these two factors was that the Company would have to pay for coal and oil delivered at their works during the coming year a sum exceeding by about £80,000 what would have been the cost in 1914-15. This represented about 1s. 1d. per 1000 cubic feet of gas sold. The increase in the price of gas as compared with two years ago was 8d. per 1000 cubic feet.

THE PRICE OF GAS AND FREIGHTAGE.

The Directors had always held, and were still convinced, that the duty and the interest of the Company alike required that the price of gas to consumers should be kept as low as possible consistent with giving a satisfactory service, and with maintaining the Company's plant in a condition of thorough efficiency. Hence, as the increase in prices of materials during the last two years had come gradually, the increases in the price of gas had also been made gradually, and only to such an extent as circumstances had from time to time rendered necessary. In this subject of freights would be found the answer to a question which might quite reasonably have occurred to the consumers and shareholders—namely, why had an increase been recently made in the price of gas, when two of their near neighbours had actually been able to announce a reduction? The answer to this was that both the companies in question had riverside works, and had been able to ship a good part of their requirements of coal in their own vessels, some of which they had recently acquired. They knew that before the war 3s. per ton of coal was a reasonable rate of freight from the Tyne to London, and that the increase in working costs was well covered by another 1s. This gave 4s. per ton, while freights had ranged for some long time past from 11s. to 15s.—a difference of 7s. to 11s. more. As each ton of coal represented a little over 12,000 cubic feet of gas sold, the extra cost arising from freight alone could easily be calculated. The rise in oil freights had, however, been still more striking. Two years ago 17s. 6d. per ton would have been regarded as a reasonable rate from the port of shipment in America to London. Now they had freights in the neighbourhood of 150s., or 132s. per ton more! The proprietors might rest assured that, so soon as conditions would permit the manufacture of gas at a lower cost than at present, the price would be reduced. Meanwhile, it was not alone the consumers who were penalized by circumstances. The holders of the "sliding-scale" stocks would receive a lower dividend; and the bonus credited to the employee co-partners had for the time being—it was hoped for a short period only—been wiped out.

INCREASE IN THE SALE OF GAS.

As he had said, apart from these parallel movements of cost of manufacture and selling price, the progress of the business had been on normal lines. The increased quantity of gas sold—2·72 per cent.—was, the Directors thought, satisfactory, bearing in mind the altered conditions of lighting brought about by the war and by the passing of the Summer Time Act. What precisely was the difference which this had made in the quantity of gas used for lighting, they would never know, masked as it was by the conjoint use of gas for cooking, heating, and industrial purposes. It must, however, have caused a substantial reduction, which was what the Government desired; and the fact that, notwithstanding this, they could record an increase in the output showed a steady supersession of coal by gas for the purposes of producing heat and power. This also represented an economic tendency of national value, as witness the many official recommendations of the past year to use gas wherever possible in place of coal. They had continued to increase the number of gas-stoves and other appliances in use in their district. An increase of 1732 on the half year marked continued advance in this direction, even if not at quite the rate of the recent past. Croydon was not, and did not appear likely to become, an industrial centre. Its development in the main was that of a suburban residential area; but it was interesting to note that, in addition to a certain demand for gas for munition works, there had recently been established in the district several businesses engaged in manufactures hitherto chiefly carried on abroad. These latter, it was hoped, would continue after the war, and give rise to an appreciable demand for gas.

THE DELAYED NEW HOLDER.

He stated last February that they hoped by this autumn to have completed and brought into use the new holder at the works. The tank was finished over a year ago, but progress with it had now been entirely stopped owing to the requirements of the Ministry of Munitions. Not only did this mean a large sum of money (over £30,000 had been expended by the Company already) lying idle for an indefinite period; but the additional storage capacity was sorely needed in the winter months (and even in the summer over week-ends), and the lack of it hampered the Engineer in his working. Moreover, it prevented the making of gas quite as economically as would otherwise be possible. They could only hope that the growing superiority in munitions might speedily lead to a result which, without delaying the complete victory of the Allies and themselves, might allow of some diversion of this country's industrial efforts to work which was sorely needed.

THE POSITION OF RESIDUALS.

Residuals, with the exception perhaps of tar, had given good results; and he hoped would continue to do so, though they could not expect these to yield—during the coming year—an increase commensurate with the additional cost of raw materials. With regard to sulphate of ammonia—a fertilizer of very great value, but the usefulness of which had not been appreciated by the agriculturists in past years nearly so much as it should have been—the Board of Agriculture had made very strong efforts to ensure supplies for farmers at relatively low prices, to take the place of imported manures which were now not available. They had taken and threatened very drastic action, to the extent of stopping or restricting exports. The chief makers in the country were meeting their views both in regard to supplies and price, in a manner which they should, and he believed did, regard as patriotic. In their own case, what they were doing meant that they expected to sell a considerable portion of their make for home use at prices about £2 per ton below what they could get in the open market for export. If this led, as they hoped it would, to a largely extended use of sulphate by farmers in this country, and the consequent establishment of a steady home demand such as had in past years been obtained in France, Belgium, the United States, and Germany, they might hereafter be able to realize that the present loss was paving the way for future gain.

COAL STOCK.

They had been able to get in a fair stock of coal, which, though by no means all they could have wished, would, it was believed (provided deliveries were reasonably kept up during the autumn), enable them to start the winter with something in hand.

TAR DEHYDRATION AND INCREASED BENZOL AND TOLUOL SUPPLIES.

Early in the year, the Directors placed an order for a tar dehydration plant. This they hoped to have had available for the summer, to enable them to freely supply the tar requirements of the local authorities for road purposes. But he regretted to say the contractors had failed them. Their inability to treat the tar on their own works had resulted in a very considerable loss of revenue; but they looked when the season for road treatment came round next year to be free from the difficulties experienced this. The Directors had also under consideration the erection of a plant to enable the gas to be more effectually treated for the extraction of the toluol and benzol required by the Government than was possible with the present plant; and the Directors would probably apply to the Board of Trade, under the recently passed Gas (Standard of Calorific Power) Act, to substitute a standard of heat for the now somewhat obsolete standard of light prescribed in the existing Acts. This was in line with the whole trend of recent gas legislation, and would, the Directors were satisfied, prove beneficial to consumers and shareholders alike.

THE FINANCIAL RESULTS.

The financial results of the half year would enable the Directors, after making some small provision for the impending extra cost of coal and oil, and after providing for certain renewals about to be undertaken in the manufacturing and distribution plant, to carry forward, after payment of the dividend, the sum of £12,759, as compared with £10,670 brought into the account.

THE WAR BONUS TO EMPLOYEES.

He had left till last, mention of one item of expenditure which, as the proprietors would see from the accounts, was a large one. He referred to that headed "War Bonus and Allowances to Dependants of Men on Service," which amounted to £3784, as against £2077 last year. The Directors had recently revised the scale of war bonus to workmen and officials; and in the next few half years this item would, in all probability, be heavier still. He was sure, however, that the proprietors would not grudge an expenditure which, on the one hand, lightened in some measure the pinch of high prices (which employees with fixed wages must now feel acutely), and, on the other, removed from the minds of the large number of their employees who were now serving their country in the Army and Navy anxiety as to those left at home.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby) seconded the motion, which was unanimously adopted.

THE DIVIDENDS.

Mr. WILLIAM CASH, F.C.A., proposed the declaration of dividends at the following rates per annum, less income-tax: 14½ per cent. on the "A" stock, 11½ per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock. In doing so, he remarked that this resolution had on many occasions been in the hands of their late lamented colleague, Sir Corbet Woodall; and, in now moving it, he would like to say again what the Chairman had already said, but from the personal point of view, in expressing regret at the loss the Company had sustained. He (the speaker) was one of those who could claim the honour of having enjoyed the personal friendship of Sir Corbet, and one of those to whom he extended that kindness on many occasions which all who knew him were fully aware they might expect at his hands. The resolution was to be seconded by Sir Corbet's son, Mr. Henry Woodall. It was a personal pleasure to him (Mr. Cash) to have Mr. Woodall sitting at their Board, and to know that they were to have the advantage of his services. He had known him for many years, and had the greatest admiration for his engineering abilities. In selecting him as they had done for a directorship in the Company, they knew that he would follow in his father's footsteps. As to the resolution, the Chairman had told them that, after paying the dividend, the carry-forward would be increased by £2089, which they might all regard with satisfaction. But beyond this they made provision of £5000 as a reserve for coal, oil, and freights, in respect of the increased cost which would fall upon this half year. Upon this condition, they might congratulate themselves.

Mr. HENRY WOODALL, in seconding the resolution, said he should

like to say how much he appreciated the references to himself that had been made (they were all too flattering) by the Chairman and Mr. Cash. All he could say was that it would be his pleasure, as it would be his duty, to serve the Company to the very best of his ability.

VOTES OF THANKS.

Mr. CHARLES WEBB moved that a hearty vote of thanks be passed to the Chairman and Directors for their management of the Company's affairs during the half year. This was no mere formality, because he believed that the vote was well deserved, especially in view of the great difficulties and anxieties that surrounded the administration of such a concern during these times.

Mr. J. T. MAITLAND seconded the motion; and it was very cordially passed.

The CHAIRMAN, on behalf of his fellow Directors and himself, acknowledged the vote. He said that these services had not been without anxiety from time to time, which anxiety was in great measure bound-up with the questions of coal and oil. As he had shown them, the cost of these essentials had risen enormously; and this had been brought about to a large extent by the considerable increase in freights. The Board had no power in this matter; and the Government did not take action in regard to them. Those who were fortunate enough to have shares in shipping companies knew quite well they had been receiving higher dividends than they used to. One did not object to receiving fair dividends; and he was sure that, from the national point of view, they would be quite satisfied with them. He must say that at the present moment, they were experiencing less anxiety with respect to the quantity of coal they were able to get. It was much more satisfactory; and they would enter upon the coming winter with lighter hearts than they did the last one. They were then much perplexed; and this condition lasted up to a short time ago. But their Engineer now reported that they were getting fairly good supplies; and it was hoped that a good stock would be built up ready for the winter's work. Proceeding to propose a vote of thanks to the officers, staff, and workmen, the Chairman said he could say nothing new about them. They had all continued to give their best services; and the Board did appreciate these services very highly indeed. As to the men at the works, Mr. Caddick reported from time to time that they were behaving in an examplary manner, and doing their best for the Company.

Mr. SAMUEL SPENCER having seconded the motion, and Mr. A. W. OKE having supported it from the proprietors' side of the table, it was heartily agreed to.

Mr. A. CADDICK (Engineer and Works Manager), on behalf of all engaged at the works, thanked the Chairman for his kind words, and the proprietors for their cordial confirmation. He felt that he could not say anything too much in praise of those who had assisted him during the past half year. The staff and workmen had done their level-best, and had given the utmost possible help under very trying conditions. He felt that in the winter through which they would shortly have to pass, he could count upon the continuance of the good feeling and help which had been experienced at their works now for so many years. They felt a great deal of anxiety at the works owing to the non-completion of the gasholder; for, when they got to winter time, a succession of frosty days meant real anxiety in keeping going.

Mr. TOPLEY, on behalf of the clerical staff and himself, also thanked the proprietors. During the past two years they had been going through anything but normal times. They had had to work with a rapidly decreasing staff under rapidly altering conditions. They had had as a staff to adapt themselves to circumstances that had altered almost from day to day. He mentioned this, because he should like to take the opportunity of expressing his personal indebtedness to the Assistant Secretary (Mr. Anderson) and the Assistant Accountant (Mr. Haines) for all they had done.

Mr. W. J. SANDEMAN (Distributing Engineer and Sales Manager) replied for his staff and himself. The vote of thanks from the proprietors was always appreciated in his department. They had had a very trying half year; but the officers and men had done exceedingly well.

HORNSEY GAS COMPANY.

Excellent Working Results.

The Half-Yearly Ordinary General Meeting of the Company was held on Friday, at No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON, the Chairman, presiding.

The SECRETARY (Mr. W. E. Roberts) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN remarked that they had succeeded, in very troublesome circumstances, in maintaining their position with regard to the output of gas. There was a decrease of o·8 per cent; but he felt sure the proprietors would share in the satisfaction of the Directors that the falling off was no greater. There was no industrial activity to be stimulated by the war in Hornsey, which was a residential district. The people were, in fact, hit by the war; and a great number of premises had been vacated. A very considerable decrease must be anticipated during the current six months, by reason of what might really be called the "Gaslight Saving Act." Then, of course, there was the cessation of public lighting, which was more or less an old story. This was an important matter for their Company. They had always been on the best of terms with the Local Authority; and the public lighting had been effected almost entirely by means of gas, notwithstanding that there was a municipally owned electricity supply. The report told them that the Bill which had been promoted by the Company received the Royal Assent on July 19. When this final stage had been reached, the Directors experienced a great measure of relief. For many years past, he personally had felt that the defining of the Company's statutory area was not satisfactory; and the Board came to the conclusion that efforts should be made to put it on a better basis. In this view they were supported by the opinion of eminent Counsel; and now that it was absolutely an accomplished fact, he could speak of the matter in terms which he should have hesitated to do before the Bill had become an Act. Without going into any details, he might say that the Company's claims to any particular area of supply were dubious and ambiguous; but now they had been defined and established in the clearest possible way, and no doubt could arise in the future as to what was their area of supply. The proprietors would read between these statements what an anxious time the Board had been through, and how important the Act was to the Company. There was another disability that they had laboured under since 1884. At that time, under circumstances which it was not easy to recall in detail, the Company gave up the right to deal in residual products. This right they had now recovered. Of course, in the past this was not a question of the supreme importance which it had attained to-day. It had, in the light of the past two years' experience, become a national matter. The country had found, in its hour of extreme exigency, that the services of the gas industry were of the utmost possible importance in providing it with munitions of war. Therefore, the Board did not wait upon the mere question of statutory powers before complying with the requirements of the Government. In connection with their Bill they were treated very well by the Local Authority, who did not oppose them: and now the Company were in a position to proceed on a common footing with other Suburban and Provincial undertakings in working-up their residuals. Of course, the advantage of this to the public was a substantial one, because any financial gain benefited them under the sliding-scale. In helping the Company in this matter, the Local Authority were really helping the public to a lower price of gas in the future; and they saw it in this light. The Company had secured various other new powers; but these, again, were shared by other gas undertakings in similar circumstances. The Directors sincerely deplored the necessity for raising the price of gas by another 2d. per 1000 cubic feet—from 2s. 11d. to 3s. 1d.—as from July last. This brought the total increase to 4d. They were charging 2s. 9d. when the war broke out; and for some little time they delayed raising the price, realizing that a low charge and a satisfactory relationship with the consumers was almost the first asset of a gas company. But even now the price of gas had been raised by less than 15 per cent., while the cost of all materials had gone up out of all relation to this figure. When they thought over the matter, they would realize what a useful alternative gas to be obtained at an increase of only 4d. per 1000 cubic feet was to enable people to evade the almost prohibitive price demanded for coal under the present circumstances. Turning to the accounts, the total capital raised was £251,563, or £463 per million cubic feet sold per annum, which they would agree was a very low figure, considering the size of the Company; and the Directors looked to see it a little lower still. Coal and coke had cost nearly £4000 more. This was equivalent to 3½d. per 1000 cubic feet, and would in itself justify the larger portion of the total increase made in the price of gas. The average cost of coal was 23s. 7d. per ton, which would be considerably increased before the country was through the period of the war. Carbonizing wages at £1830 were equivalent to a little over 1½d. per 1000 cubic feet of gas; and those conversant with gas accounts would realize that this figure was very creditable to the Engineer (Mr. J. W. Buckley). This 1½d. per 1000 cubic feet, too, comprised its share of the wages paid by way of war bonus; and this should be considered before it could be taken as a figure available for comparison with other undertakings. Allowances to dependants of employees on active service amounted to £219. For gas and rental of meters and fittings the receipts had been £1348 more; while residuals had brought in over £4000 more. The gas sold per ton of coal carbonized had reached 13,172 cubic feet; while the gas unaccounted for was only 3·3 per cent. These were both figures upon which they could congratulate the Engineer. Another excellent result was that for every ton of coal carbonized they had had as nearly as possible 11 cwt. of coke available for use or sale. The balance carried to profit and loss account was £7768; and after meeting dividend and interest requirements, there was a net deficit of £250. As to the future, they had accumulated stocks of materials to the utmost practicable extent. Coal contracts had been made; and it would appear that they might reasonably expect to get through the winter without great difficulty. Oil had risen to an almost prohibitive price; and they could make very little use of it, beyond relying upon it to meet any emergencies. Probably nobody believed that coal would ever be so cheap after the war as it was before. Certainly, no relief could be hoped for immediately on the termination of hostilities. Oil they might get somewhat cheaper, because its uses in some directions would be curtailed with the cessation of the war. He did not think wages would go back to their former level. The war had called into existence a tremendous amount of industrial plant and activity; and a great problem would be to keep the works employed after the war had passed away. The gas industry had learned that it could not stand apart any more than others from the general industrial life of the country. They were a very important part of it; and they must do what they could to preserve the industrial welfare of the country. The Directors of their Company were determined to do this, as far as they could in their small way; and they had adopted the principle that in future they would not allow the products of any of the countries now at war with Great Britain ever to be used on their premises or in connection with their business. They would also look very hard at neutral products, and would never use them if they could get home-made goods. ["Hear, hear."] He trusted that this policy would be general. If so, their people could hope to do something to provide that vastly increased measure of employment which was indispensable if the country, industrially speaking, was to adjust itself after the termination of this terrible struggle. He concluded by moving the adoption of the report and accounts.

Mr. A. F. PHILLIPS seconded the motion, which was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. J. M. MILES, dividends were declared at the rates of 5 per cent. per annum on the preference stock, 12½ per cent. per annum on the "A" stock, and 9½ per cent. per annum on the consolidated stock—all less income-tax—amounting together to £5607, and leaving £36,805 to be carried forward.

The CHAIRMAN proposed a vote of thanks to the executive officers and the respective staffs for their services during the period under review; referring again to the high pitch of excellence to which the working results had been brought.

Mr. J. CASH, seconding, said the accounts were highly satisfactory,

and reflected great credit on Mr. Buckley. Fuel was down to the very low figure of just over 12 per cent. Another striking feature of the accounts was the great increase in the returns for coke.

Mr. A. W. Oke proposed a vote of thanks to the Chairman and Directors, and pointed out how much indebted were the proprietors to them for their management of the Company's affairs.

Mr. F. J. Bancroft seconded, and said he would like to identify the shareholders with the position the Board had taken up regarding the undesirability of gas companies dealing with concerns of alien enemy origin. He noticed that Mr. Buckley also, at the last meeting of the Institution of Gas Engineers, drew attention to the question of alien enemy members. They as shareholders should support the Board and the Engineer in the stand they had made in this important matter.

The Chairman, in acknowledgment, said the matter referred to by Mr. Bancroft was one of great importance. He hoped this country would have tardily, but thoroughly, learned the lesson of the present disastrous war.

BOURNEMOUTH GAS AND WATER COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. Crispe Whiteley in the chair.

The Secretary (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The Late Sir Corbet Woodall, and His Successor on the Board.

The Chairman said, in presenting the half-yearly report, together with the accounts, for the reception and approval of the proprietors, his first words must be of recognition and of tribute to the memory of Sir Corbet Woodall, whom they missed, and whom they had lost since the last meeting. Their late colleague was for more than nineteen years a Director of the Company. He (the Chairman) thought the proprietors would remember that, at the previous meeting, he told them the quaint circumstances under which he invited Sir Corbet to join their circle. He accepted the invitation; and for those nineteen years the Company had the best service which Sir Corbet Woodall could render. He passed on to wider spheres, and gained higher positions; but he never forgot his early love. Even up to the last time that he was sent down to Torquay by the doctor's orders, although he was not allowed to attend any meetings of any kind, he still insisted upon having his documents connected with the Company forwarded to him, in order that he might from time to time send his colleagues notes and advice. *Le Roi est mort; Vive le Roi.* To-day the Board introduced to the proprietors the Right Hon. Sir Daniel Ford Goddard, the successor of Sir Corbet on the Board. Sir Daniel possessed Sir Corbet Woodall's complete confidence. He had spent a life time in the gas industry; and his attendance and help at their Board would be of the highest possible service. It might be worth while noting that, whereas, when they appointed Sir Corbet Woodall—he was Mr. Woodall at the time—upon their Board, the great Gas Light and Coke Company endorsed (so to speak) the Bournemouth Company's approval by making him Governor of their great institution. They had now reciprocated the compliment by inviting Sir Daniel Ford Goddard, who was one of the latest additions to the Board of the Gas Light and Coke Company, to also join their own Board; so that they were now fairly square in the matter. When the time came, he felt confident, the proprietors would ratify the Directors' choice, and endorse his election with their approval.

Capital, Price of Gas, and Dividend.

With regard to the accounts, he had not much to say. They were about the sort of accounts the proprietors would expect under present circumstances. It would be noted that the Board had raised no further capital during the past six months, and that they had written-off for depreciation of works displaced more than the amount of capital they had expended. He might add, and this would probably be a source of satisfaction to most of the proprietors, that he saw no necessity for any large capital outlay in the immediate future; and he hoped they would be able to stand at the present stage for some little time. With respect to the price of gas, it must remain for the present, so far as their Company was concerned, at the existing rate. It was, however, interesting to make comparisons with other companies. Some who were not so careful perhaps in raising the price of gas as they had been, had been able to reduce it at an earlier stage. In their own case, having been careful in increasing the price of gas, they must be equally careful in reducing it. In the meantime, they were paying their full statutory dividends.

Difficulties, Consumption Increase, and Costs.

Bournemouth, he might say, had been very popular, and remained so. At the present time, it was as full as it could be. It was supposed—and long might the supposition remain correct—to be free from the dangers which surrounded other seaside places. He almost felt inclined to "touch wood" in making such a statement. Their increase in the sale of gas was 1·7 per cent.; and this notwithstanding that they had reduced public lighting, the Daylight Saving Act, and other war economies. During the past half year, their difficulties had been undoubtedly great; and their anxieties had been many with regard to the cost of coal, oil, and acid especially. He thought they might congratulate, and he did congratulate, their Acting General Manager (Mr. P. G. G. Moon) upon the fact that he had been able to hold his own. But it had been at a price. It might interest the proprietors to know that the average cost of coal and freight in 1914 was 18s. 3d. per ton; in 1915, it was 20s. 8d.; and in 1916 it had reached 26s. 7d. He was bound to say it was still going up; and he could not offer the proprietors any hope that the prices were likely to be diminished under present circumstances. The increased demand for coke partly compensated for the enhanced price of coal; but, on the whole, when they considered the crisis under which they were at present working, he thought they might fairly say the result of their operations had been satisfactory.

The Men at the Front, a Profit on Shells, and Benzol and Toluol Extraction.

Some fifty men, in addition to the former number, had joined the Colours since the last meeting; and the number was now about 250. Some of the latest of these men to join were some of the most important; and the Company were experiencing considerable inconvenience owing to their absence. They had formed what was now universal—a female staff of employees for meter reading and complaint work, and for the offices and the showrooms. The members of the female staff were now doing thoroughly well in their new work, and improving every day. The Company had completed their shell contract; but they were, of course, continuing under Government orders to extract benzol and toluol from the gas; and he was bound to admit that naturally they had had a slight decrease in the candle power of the gas. But this, he was also pleased to say, had been met by their consumers in a very loyal way. The Company had had no complaints, and the consumers had received the reduction—the necessary reduction—in the illuminating power of the gas in the most enlightened and patriotic manner.

The Water Undertaking.

He seldom had much to say at these meetings regarding water. But people were flocking to Bournemouth; they were having very hot weather; and the heights of a few of the houses were an extremely disagreeable feature when they had to pump water to the tops. He would not say they were not anxious in the matter; but they were doing their best to accommodate their customers. However, whereas they had their anxieties with regard to the quantity of water, they had no anxiety with regard to its quality. The quality remained as it always had been—excellent. The reports from their Analyst were all that could be desired; and he might say that they never lost sight of the importance (important as it was to all towns) to such a town and health resort as Bournemouth of having a pure supply of water.

Congratulations.

In conclusion, he could not speak too highly of the services Mr. Moon and his staff had rendered in carrying the Company through this most difficult period. He had never rested in his efforts to get coal. Now the great thing was to get it at anything like a reasonable price, which was almost impossible. But Mr. Moon had done his best; and the Directors had done their best. On the whole, he thought he was presenting a report and accounts which, although not quite of the same character and description as those of the past had been, they were, when the circumstances under which they had been produced were considered, as valuable and important to the Company as they had ever been in its history.

Mr. William Cash, F.C.A., in seconding the motion, joined with the Chairman in saying that, under the difficulties and circumstances surrounding the work which they had had in hand, the proprietors were to be congratulated upon the accounts as presented. He should like to have the opportunity of saying a few words in emphasis of what the Chairman had said in regard to the late Sir Corbet Woodall. He (Mr. Cash) was associated with him in a great many directions; and in the whole of these associations he had nothing but happy memories. He had received many kindnesses at the hands of Sir Corbet; and no one could regret more than he that Sir Corbet had been taken from them. No words of his were required in reference to the services rendered to the Company. The proprietors knew of them; and those on the Directors' side of the table knew of them. As to the question of the illuminating power of the gas, which the Chairman had said had been slightly reduced, as his words would go to not only the stockholders assembled in that room, but to many residing in Bournemouth, he should like to point out one thing—that great pains had been taken by their Acting General Manager to maintain and to keep up the standard of calorific value of the gas, which was at the present day recognized by all gas engineers as the more important quality in gas. At the present day, cooking and lighting by incandescent burners were the two most important factors with which they had to deal; and it had been recognized by Parliament that calorific value was the real serious test that should be applied to gas. Then he thought they might congratulate themselves upon one other fact that emerged from these accounts. That was, the satisfactory position they were in in regard to their cash resources. During the last few years, the Directors had made several issues of capital; and they were very glad to-day that they made these issues. One member of their Board, Sir Charles Jessel, held very strong and, as they turned out, very accurate views with regard to the fact that the value of money would increase, and that it was desirable they should take early opportunities to place such capital as might be necessary. The result was before the proprietors that day in the fact that was disclosed by the balance-sheet that they had a substantial balance—they had temporary investments, and they were paying their dividends from available funds, and there had been no occasion to invoke the assistance of their bankers. The Chairman had alluded to their officers and staff. They thanked them for all they had done. There was no need to tell the proprietors that these were difficult times. There were questions which must arise between Capital and Labour; between employer and employed. The policy of the Company had always been to act in sympathetic manner to their staff and to their workpeople, and to do what they believed to be right, under all circumstances, between them and the proprietors and consumers. Co-partnership was instituted some time ago; and, under the terms of the co-partnership, the bonus they were able to declare this year—determined as it was by the price of gas—had necessarily been reduced. On the other hand, the Directors had granted certain sums as war bonus on three occasions; and this war bonus had been revised in the light of circumstances which had gradually developed. He was sure, speaking for the Board as a whole, that the relationship which had continued between them and their men would be continued in the future; and their employees knew that they would have the sympathy of the Board when various questions came up for final revision after the war was over. Some of these questions must be of a temporary character. The

Chairman had alluded to the fact that they were attempting to make provision to a certain extent for the men who came from the front. When these men returned, as they hoped they all would, or rather they trusted the great majority of them would, the whole of the questions between the employees and the Company would require consideration; and he could assure the men that they would all be dealt with as sympathetically as in the past.

The motion was unanimously adopted.

DIVIDENDS DECLARED.

The CHAIRMAN moved the payment of the statutory dividends, all less income-tax—viz., at the rates per annum of 6 per cent. on the preference shares, 7 per cent. on the "B" ordinary shares, and 15 per cent. on the original shares.

The Right Hon. Sir DANIEL F. GODDARD, M.P., seconded the motion, which was unanimously carried.

VOTES OF THANKS.

Mr. A. W. OKE proposed a vote of thanks to the Chairman and Directors, the officers and their staffs, and the workmen. He remarked that the proprietors fully endorsed all that had been said as to the loss the Company had sustained by the death of Sir Corbet Woodall; and they also felt that a wise choice had been made by the Board in filling the vacancy. He commented, too, upon the (considering all the circumstances) satisfactory character of the accounts.

Mr. F. G. BARRETT seconded the motion, which was cordially passed.

The CHAIRMAN, in reply, said his colleagues and himself felt that the vote represented the feelings of the great bulk of proprietors who were behind those present at the meeting; and they accepted it as recognition of work which had certainly been of an anxious character during the last six months. Mr. Moon would say a few words, and tell the proprietors, from his point of view, of the trials and difficulties the Company had passed through. They were not yet out of the wood. They were pressing on steadily; and, they trusted, they were going to face the difficulties that might come with as much success in the future as in the past.

Mr. MOON thanked the proprietors on behalf of the staff and men at Bournemouth for the vote, and the Chairman for the appreciative remarks he had made with regard to what they had tried to do there. He was not proposing, however, to say anything about their difficulties. He thought if he simply left it with the remark that they were carrying on satisfactorily, this would be quite enough. He was certain that everyone at Bournemouth fully recognized the fact that they were working for an enlightened and appreciative Board, who felt they were doing their best with the immediate work before them, while they were also contributing their share towards the nation's needs. He was quite certain that all the Bournemouth staff had in the past half year done their very best; and in speaking of the "staff," he, of course, included everyone from the latest female slot collector to the higher officials on the staff. He should like to take the opportunity of saying, as representing the Bournemouth staff, how much they felt the death of Sir Corbet Woodall, who always occupied a very special place in their hearts, not only because of the close personal ties that existed between him and the Company through his son, their chief, but also because of his genial, kindly disposition, and the feeling they all had that everyone's interests were of deep moment to him. He was sure the proprietors would also be pleased to hear that Major Woodall, their General Manager, had received promotion since their last meeting, and was now Assistant Quartermaster General with the First Division—the Fighting Division of India. This was a very great honour. He (Mr. Moon) understood from Major Woodall's immediate predecessor, who was now in England, that the post had never before been held by a Territorial Officer; and when they realized that the Territorial Officer in the present case was only two years ago a civilian, it spoke highly indeed, he thought, for Major Woodall's capacity. They at Bournemouth felt the promotion was an honour, and that to some extent they shared in the reflected glory of it.

Mr. PLUMB, in his acknowledgment on behalf of the London staff, said the Company, in common with all gas undertakings, had had a certain amount of difficulty in carrying on their work; but they shared it with the country. It was a passing difficulty; and as the country would come through triumphant, so would the Company.

Sheffield Engineering Rates of Pay.—A mass meeting has been held of members of the Sheffield branch of the National Union of Gas Workers (Engineering Section), to hear from Mr. C. H. Blackburn and others who had been appointed a deputation to see the engineering employers, the result of the conference which took place. The application of the employees was for an advance to bring them up to the same standard of war bonus as had been agreed upon in the North, Manchester, the Midlands district, and Barrow-in-Furness. Mr. Blackburn explained that the employers had made an offer of 1s. 6d., which would bring the war allowance up to 5s. 6d. per week. The meeting considered that, in view of the extremely high cost of living, the offer of the employers was inadequate; and they unanimously rejected it. An instruction was given to their representatives to press for the full demand of 3s.—that is, an all-round advance, in addition to the 4s.

Threatened Water Shortage at Bradford.—It was reported to the last meeting of the Bradford Corporation Water Committee that a serious situation in connection with the town's water supply may arise through the refusal of the Local Government Board to sanction a loan to enable the duplication of the main from the Nidd Valley to be effected. The time has come when the inhabitants are face to face with the certainty of an intermittent supply. Bradford is consuming 17½ million gallons of water per day; but the existing pipes are capable of carrying only 16½ million gallons. There is sufficient water in store to meet the demands; but as the requisite quantity cannot be brought to the city, the service reservoirs are gradually being depleted to the extent of a million gallons a day. An accident to the Nidd single line of main would, it is pointed out, at once deprive half Bradford of water. The Committee delegated full powers to the Chairman (Alderman Fawcett) and the Water Engineer (Mr. James Watson) to act as they may consider best in the circumstances.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 28.

Pitch continues steady at 20s. per ton net in bulk, at makers' works, and more activity is anticipated now that the export season is commencing. There is no change to record as regards creosote. Other values are: 90-160 solvent naphtha, 2s. 3d. per gallon, naked; crude tar, about 2¼d. per gallon, in bulk; 48-50 per cent. anthracene, 3d. per unit, casks free—all at makers' works, net cash.

The export price of sulphate of ammonia for prompt delivery is £17 5s. per ton net into buyers' bags, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

Aug. 28.

There is practically nothing fresh to report concerning the market for tar products. Creosote is still very quiet. Solvent naphtha is in fair demand. Heavy naphtha is quiet.

The average values of gas-works products during the past week were: Gas-works coal tar, 15s. 6d. to 19s. 6d. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast, 15s. to 15s. 6d. Manchester, 16s. to 16s. 6d. Liverpool, 17s. to 18s. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6⅝d. Solvent naphtha, naked, North, 1s. 10d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2d. to 2¼d. Heavy oils, in bulk, 3⅞d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Aug.* 26.

During the past week there has been little animation in the market, owing to the withholding of export licences by the War Trade Department. The tone has remained fairly steady, but any change in prices has been in a downward direction. It has transpired that an appreciable number of orders have been booked for home consumption for both agricultural and munition purposes. The nearest values at the close are £17 10s. per ton f.o.b. Hull, £17 15s. f.o.b. Liverpool, and £17 17s. 6d. f.o.b. Leith. The uncertainty of the outlook seems to have had the effect of stopping transactions in the forward position, and, though the ideas of makers have become more moderate than they were a week ago, buyers have shown little disposition to operate.

Nitrate of Soda.

There is still no change in this market, and quotations remain at 17s. 6d. per cwt. for ordinary, and 18s. for refined quality, on spot.

Sulphate of Ammonia.

From another source, it is stated that the prices for this article are as follows: Outside London makes, £16 17s. 6d.; Hull, £17 10s. to £17 12s. 6d.; Leith, £17 15s.; Liverpool, £17 15s.; Middlesbrough, £17 12s. 6d. to £17 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is still dull, with low prices quoted for coal for prompt delivery, though rates are nominally better for the next few weeks. A good deal of coal is now being sold for France, which is one of the best customers for North-Country coal at the scheduled prices and freights. The home demand is full; but, with the regulated prices here, some producers are looking more to the export trade. In the steam coal branch, prices are very irregular, ruled a good deal by the time of delivery. For best Northumbrian steam coals, the current quotation may be put as varying from 36s. to 45s. per ton f.o.b.; second-class steams, 30s. to 35s. per ton; and steam smalls, from 22s. 6d. to 27s. per ton. But the tone of the market may harden as the beginning of September is reached. The output is fair, and is well taken up when steamers arrive punctually. In the gas coal trade, there is steadiness for best qualities; but second kinds seem more plentiful, and are quiet. Best Durham gas coals are about 34s. 6d. to 35s. per ton f.o.b.; and second classes from 28s. to 30s. per ton; while "Wear Specials" are 37s. 6d. to 38s. 6d. per ton f.o.b. Deliveries are fuller on long contracts; and for the mines the output is about normal under current circumstances. Few new contracts are in treaty; but one or two lots of coal have been sold forward to France at prices near the scheduled rates. Durham coals generally are in improved demand, especially for coking; so that at present the market is stronger than that for steam coals. Coke is firm, and, in spite of high freights, the exports of it are very heavy. In the past few days 36s. has been paid as freight on coke from the Tyne to Havre, and 36s. 6d. to Treport. Good gas coke is well maintained in price at 32s. 6d. to 35s. per ton f.o.b. in the Tyne.

A meeting of the creditors in the matter of the Middleham (Yorks.) Gas and Coke Company, Limited, in voluntary liquidation, has been held. The Liquidator is Mr. R. W. Robinson, of Middleham.

The incandescent lighting catalogue for the season 1916-17 of the Provincial Incandescent Fittings Company ("Pifco"), Limited, of Manchester, lists a number of lines of goods of which supplies can be maintained, together with the pre-war stocks now fast being cleared. Among the chief features noted, additions have been made to patterns of "Protect-a-Lite" unbreakable globes and chimneys; and a variety of shades are included to meet the lighting restrictions. Other goods that may be mentioned are several types of gas room-heaters for fitting on to brackets.

Water-Works and Leaving Certificates.

The question as to whether Corporation water-works are a factory within the meaning of the Munitions Act came before the Sheffield Munitions Court last week. Sir William Clegg presided. Cuthbert Clixby, who is employed at the water-works, applied for a leaving certificate; but the Court decided that the works were not munition works, and that therefore they had no jurisdiction. Mr. E. B. Gibson (Deputy Town Clerk) argued that the works did come within the Munitions Act, inasmuch as they were supplying 3 million gallons of water a day to munition works. Sir William Clegg said they were only indirectly affected by the Act. Mr. Gibson submitted that they were in the same position as a firm supplying tools to a munition establishment. Sir William Clegg held to his own view of the law, but suggested that Mr. F. J. O. Coddington (the representative of the Ministry of Munitions) should make a note of the matter. If it was found that he (Sir William) was wrong in his interpretation, he would be glad to review the case. On the merits of the application, apart from jurisdiction, he did not think Clixby was entitled to the certificate; but at present he did not consider that they could refuse it.

A Gas Stoker's Broken Contract.

Appearing before a Bench of Magistrates at the Chester City Police Court, William Hulse, a gas stoker, pleaded guilty to having wilfully and maliciously broken his contract of service with the Chester Gas Company. Mr. Dutton, who prosecuted, said that one afternoon when defendant came on duty he found there was some slight trouble with the pipes; and he went to the foreman and told him he was not going to tackle the job. He did no work that afternoon. If all the stokers had adopted the same course, the results would have been very serious indeed. Defendant had, however, since expressed regret for his action, and asked to be taken back again. This being the first case brought by them under the Conspiracy and Protection of Property Act, the Company asked the Bench to deal leniently with him. John Machin, a foreman, said defendant told him the pipes were in such a state that he was not going to stop and see about them. It was work which would naturally fall on the stoker. Defendant offered to work out his week's notice in the yard; but, of course, the yard was not a stoker's place. Mr. J. C. Belton (the Engineer) stated that the trouble with the pipes was at the time more acute than usual; but there was nothing in it to entitle Hulse to refuse to tackle the work. The Chairman said that the defendant had been brought there as an example to others in the city. He was employed on important work, and it was necessary that he should continue at it. He was liable to a fine of £20 or three months' imprisonment; but the Bench would take a lenient view of the case and fine him 6s., or seven days' imprisonment. The Company did not ask for costs.

Bristol Water Company's Debenture Stock.—The Chairman (Mr. H. N. Abbot), presiding at an extraordinary meeting of the Bristol Water-Works Company last Tuesday, stated that it was called to enable the Directors to take advantage of their Act of 1914 to create £25,000 of 3½ per cent. debenture stock. They could not issue more than £10,000—the Treasury having put an embargo upon the spending of too much money in war time. He proposed a resolution to this effect, which was agreed to.

A Gas-Fitter's Conditional Exemption.—An applicant to the Walton-on-the-Naze Military Tribunal, 41 years old in three months' time, and a gas-fitter in the service of the Tendring Hundred Gas and Water Company, stated that he had been before the military authorities at Colchester, who, in consideration of his being practically unfit, extended the time of his joining-up by ten days, in order to give him the opportunity of appealing to the Tribunal. The Manager of the Gas-Works (Mr. W. J. Sumner), who appeared in support of the application, stated that the man was the only gas-fitter left, and that under existing circumstances it would be almost impossible to replace him. He was granted conditional exemption.

Wellingborough and the Calorific Standard Act.—For over twelve months, tar washing has been in operation at the works of the Wellingborough Gas Company; and at the request of the Ministry of Munitions, the Directors have now decided to erect a plant for the recovery of crude benzol. In consequence of this, they are applying to the Board of Trade for an Order under the Gas (Standard of Calorific Power) Act, 1916, substituting a standard of calorific power for that of illuminating power. In their report for the past half year, the Directors state that the lighting restrictions and the Summer Time Act have been responsible for a reduction in the consumption of gas amounting to nearly 9½ per cent., as compared with the corresponding half of last year. The dividends recommended for the six months are 6⅝ per cent. on the original shares and 5⅛ per cent. on the additional shares, less income-tax.

Price of Gas at Haywards Heath.—The Haywards Heath Urban District Council have decided to protest to the Gas Company against a further increase in the price charged for gas from Sept. 29. Mr. Plummer said it might be matter in which the Council had no *locus standi*, and of which they should not take any notice; but he felt strongly that there were two grounds on which they were entitled to protest. Firstly, it was giving articulate expression to the strong feeling existing among the ratepayers and residents generally; and, secondly, the Council themselves in ordinary times were very considerable consumers of gas. On the part of the Council there was every disposition to sympathize with the Company in the increase of expenses which, in common with everybody else, they had to meet; but he was bound to say that there was a strong and growing feeling that the large increase foreshadowed was not altogether necessitated by the exigencies of the war. He felt very strongly that the Council should ask the Company to reconsider their decision. It was against the best interests of Haywards Heath that the price of gas should be raised as proposed. Mr. Finch did not think the Council would alter the opinion of the Company, whose idea, he said, was that by raising the price there would be more profit. This was the greatest mistake in the world.

Reduced Output at Southend.

The report adopted at the half-yearly meeting of the Southend Gas Company last Tuesday, stated that the quantity of gas sold during the six months was 182,171,900 cubic feet, which, compared with the corresponding period of last year, showed a decrease of 11·81 per cent. In consequence of the considerably increased cost of coal, oil, &c., despite vigilant attention to working costs, the Directors were compelled to increase the price of gas from Lady-day quarter last to 3s. 8d. per 1000 cubic feet; and so long as high prices rule at the pit's mouth, with unprecedented freightage rates and a decreased output of gas, a reduction of the present charges must be postponed. The number of consumers was 18,334, of which total 13,128 were automatic. During the half year 1115 gas cookers and fires had been sold and let on hire. The profit and loss account, after transferring £120 from the reserve fund account, showed a balance available for dividends of £6605; and it was recommended they be paid at the rate of 5 per cent. per annum on the original and new ordinary stocks and 4⅝ per cent. per annum on the new ordinary "B" stock (all less income-tax at 4s. in the pound). These would amount to £6062. The Engineer and Manager (Mr. C. S. Shapley) stated in his report that alterations had been made to the high-pressure system, thereby effecting an improved supply of gas to the Westcliff and Southchurch districts. There was considerable improvement in the efficiency of the plant at the works. The Chairman (Mr. J. H. Burrows, J.P.) said he thought that when the war was over the people of the country might have something to say of a strong nature to those who controlled the output of coal, and something still stronger to those who were responsible for the freightage; for, because of these extra charges, they, and all other gas companies, had been forced into positions of substantial difficulty—more particularly those who had suffered, like themselves, while paying these largely-increased prices, a diminution in their sale of gas.

Suicide by Gas.—A Coroner's Jury at Ipswich, after inquiring into the death of John Cole, found that he was suffocated from inhaling gas fumes while in an unsound state of mind brought on by domestic troubles. Cole, who had been summoned by his wife for uttering threats against her, was found lying on his bed dead. The room was full of gas, the burner having been tampered with; and the chimney was blocked up.

Grays and Tilbury Gas Company.—It was stated at the recent meeting of the Company that the gross revenue, in spite of a loss of over £1000 a year from public lighting, had during the past six months increased by £781. On the other hand, the expenses had been more by £744, chiefly due to the increased cost of coal, labour, and material. The ratio of working expenses to revenue was 71·3 per cent., which was satisfactory. Sales of gas by meter showed an increase of 1·64 per cent.; and a further reduction in leakage was reported. Dividends were declared for the half year at the rates of 8½ per cent. per annum on the "A" shares and of £5 19s. per cent. per annum on the "B" shares, less income-tax.

Public Lighting Question at Midhurst.—In the course of the proceedings at a parish meeting at Midhurst, it was announced by the Chairman of the Council (Mr. T. E. Stephens) that they had not yet come to any satisfactory arrangement with the Gas Company, because they considered the tender submitted was too high. It was pointed out by one speaker that if the lamps were lighted, they would have to be blackened upwards from the horizontal and whitened below; so that they would show only a diffused light on the ground; and Mr. Glazier remarked that, under these circumstances, it would be better not to light them at all. Ultimately, it was agreed that the Council be recommended not to light the lamps unless a more moderate tender could be obtained from the Gas Company.

Gloucester Gas Company's Profit-Sharing Scheme.—The eighth annual meeting in connection with the Gloucester Gas Company's profit-sharing and saving scheme was held last Wednesday evening—Mr. J. M. Collett presiding. The Committee's report for the year ended June 30 stated that the amount of bonus was £342, which was less than last year, owing to the price of gas having been raised from 2s. 1d. to 2s. 6d. per 1000 cubic feet. Since the last meeting, £700 of War Loan stock had been purchased. In accordance with the wishes of the members, 5 per cent. of last year's bonus, amounting to £30, was subscribed to the British Red Cross Society. The present number of members was 122. The Chairman mentioned that 23 members were serving with the Colours, in addition to other employees of the Company who were not members.

British Mannesmann Tube Company Control.—In connection with the matter which was mentioned on p. 361 of last week's "JOURNAL," the London correspondent of the "Western Mail," under Wednesday's date, said: "Although no official confirmation is forthcoming of the report that a Scottish firm are taking a controlling interest in the British Mannesmann Tube Company, there is good authority for saying that negotiations have proceeded to such a point that an announcement is possible next week of a final arrangement on the lines suggested. A gentleman interested in the trade informed me to-night that the offer with which the Company were now understood to be closing was by no means the first the Directors had received, and that two firms in the Swansea district had offered big figures to buy out the whole undertaking. As a matter of fact, it is no secret now that Messrs. Baldwins, Limited, had been bidding high for the works, but that they were outbid by a firm with headquarters in Glasgow, who, I hear from the best source, have agreed to pay over half-a-million for the undertaking. It is understood that the Government are primarily responsible on one side for the negotiations which appear to have now been carried to a successful issue." Subsequently it was officially announced that the shares of the Company had been sold by the Public Trustee to a British group including Sir Hugh Bell, Mr. A. J. Dorman, Messrs. Balfour, Williamson, and Co., and Messrs. Higginson and Co. All German interest in the Company has been eliminated; and it is the intention of the new controlling interests to constitute a representative Board to continue the business of the Company on an entirely British basis.

New Work by the Coppée Company (Great Britain) Limited.

In connection with extensions which are being carried out at Port Talbot by Messrs. Baldwins Limited, we are informed that the contract for the coal washing and coking installation has been placed with the Coppée Company (Great Britain) Limited, of King's House, Kingsway, London, W.C. The plant consists of a Coppée coal washery to wash 120 tons per hour and 120 Coppée regenerative coke-ovens, with bye-product plant for the recovery of tar, ammonia, and benzol, and the manufacture of sulphate of ammonia and the rectification of the benzol. A 700,000 cubic feet gasholder is being supplied. The Company have also secured the contract for the coal washery and bye-product coke-ovens to be installed by the Redbourn Hill Iron and Coal Company, Limited, at Frodingham. This plant comprises a Coppée coal washery to wash 80 tons per hour, and 88 Coppée regenerative bye-product ovens. Tar, ammonia, and benzol will be recovered and sulphate of ammonia manufactured; the benzol being rectified and pure products made. A gasholder of 700,000 cubic feet capacity, for the surplus coke-oven gas, is also included. Further, the Company recently commenced work on the foundations of the new washery which they are installing at the Gedling Colliery of the Digby Colliery Company, Limited, Nottingham. This plant is to be able to treat 112 tons of coal per hour from 3 inches to 0. It is stated that it will be the most modern and up-to-date plant in the district.

Less Gas Supplied at Grangemouth.—The Gas Committee of the Grangemouth Town Council have reported that the decrease in the production of gas during the past year was valued at £250. The falling-off was caused partly by reason of the irregularity of the men employed in the works, and partly by flooding which occurred on four occasions during the year. The leakage of gas was the highest since the works were taken over, and had been caused by the breaking of pipes from the works through subsidences. All leaks discovered had been repaired. The Committee had decided that to make up the deficit in the current year it would be necessary to increase the charge for gas. They recommended that the price in the case of slot-meters should be 5s. 11d. per 1000 cubic feet, and for ordinary meters 5s. 5d., the increases to take effect as from the date of the next surveys of meters. Mr. Sharp, in moving the adoption of the report, said that, in addition to the ordinary expenditure, which remained practically normal, they had to allow for a new roof to the retort-house, which would cost about £250, a bad debt incurred two years ago amounting to £105, the extra interest on the sinking fund £160, and a deficit of £1216 incurred during the past two years. Bailie Gloag remarked that Mr. Sharp's statement would provide little comfort to the ratepayers who were called upon to pay an increase of 5d. for the gas last year and of 1s. 8d. for part of this year, with little prospect of things brightening. He was not sure that the best results were being secured from the plant, and thought they should have some improvements effected in the management of the works.

Unaccounted-for Gas at Haverhill.—At the meeting of the Haverhill Urban District Council, attention was drawn to an increase in the gas unaccounted for. Mr. Backler said that in the year ended June, 1913, the unaccounted-for gas stood at 8·4 per cent.; in 1914, the percentage was raised to 10·8; in 1915, it went to 11·62; while it had since risen to 15·03 per cent. Now the result of the reading of the meters from April 1 to July 1 showed a loss of 21 per cent., which was very disquieting. Several large leakages had been discovered and repaired; but an increasing percentage of loss was still unaccounted for. Mr. Unwin suggested that the Gas Committee should take into consideration the advisability of securing an expert's opinion on the whole question. Mr. Bigmore believed that the mains were to a great extent responsible for the loss, as the roads had had to bear an exceptional amount of heavy traffic during the past few years. The matter was eventually referred to the General Purposes Committee.

Gas-Stoves in France.—Revin, in the Department of the Ardennes, the centre of the cast-iron industry in France, the "Ironmonger" remarks, has been in German occupation since the first weeks of the war. Parts of ranges were manufactured in that region and shipped to Paris or Lyons to be assembled. Lack of raw material and the dispersion of skilled labour have had a marked effect on prices, which have practically doubled. Thus the principal buyer at Marseilles—the Compagnie du Gaz et de l'Electricité—which formerly paid 17 to 18 frs. for the variety of small gas-stoves most commonly used, now pays 35 frs. Some ranges are also imported from Britain; but both in France and Britain deliveries are very slow. The Cie. du Gaz de Marseilles sold about 5000 gas-ranges in 1913, the great bulk of which measured 30 centimetres (11¾ inches) or less in height. In all Marseilles kitchens, in order to save space, the gas-range is placed on the "potager"—a large range set in brickwork. There exists, therefore, only a very limited demand for large gas-ranges.

Southgate and District Gas Company.—In their report for the six months ended June 30, the Directors state that, compared with the corresponding half of the previous year, the sale of gas shows a decrease of 1,595,200 cubic feet, or 1·45 per cent.; while the revenue from residual products exhibits a decrease of £390, owing in part to a diminution in the quantity of coal carbonized. After providing for interest charges, &c., there remains a balance of profit of £5082; and the Directors recommend dividends for the half year on the preference capital at the rate of 5 per cent. per annum, on the original capital at the rate of 10 per cent. per annum, and on the additional capital at the rate of 7 per cent. per annum. This will require £4325, and leave a balance of £757 to be carried to the credit of the profit and loss account for the current half year. Contracts recently entered into for the usual supplies of coal were made at an appreciable increase of price; while the cost of oil advanced to an important extent during the latter part of the half year. The full burden of the increased prices will fall upon the current six months. The reduced hours of lighting, due to the operation of the Summer Time Act, have resulted in checking the sales of gas to a small extent.

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East Greenwich Gas-Works Flower Show.—There was a large attendance at the East Greenwich Gas-Works Institute on Saturday, on the occasion of the annual flower show in connection with this station of the South Metropolitan Gas Company. Though the display was smaller than on some previous occasions, it was gratifying that, with so many former exhibitors now serving with the Colours, the show was so extensive. Mr. James White presided at the opening ceremony; and the judges were Messrs. H. J. Jones, Monk, and Duck.

Weston-super-Mare Gas Company.—At last week's meeting of the Company, the maximum statutory dividend of 5 per cent. on the consolidated ordinary stock for the half year was declared. The sales of gas showed an increase of 4¼ per cent., which, under all the circumstances, the Directors regarded as highly satisfactory. It was stated that coal contracts for the ensuing twelve months had been entered into at prices which compared favourably with those paid by the generality of gas undertakings. The new works were continuing to give good results; but great difficulty was experienced in securing the necessary labour.

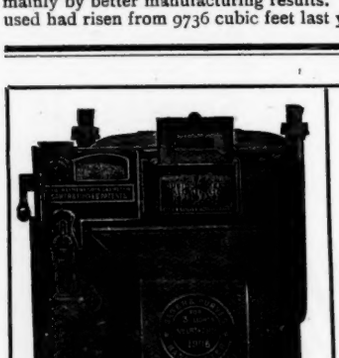
Camborne Gas Company.—In the report presented to the annual meeting of the Camborne Gas Company last Friday, the Directors stated that, though the high price of coal, the lighting restrictions, and the Summer Time Act had seriously interfered with the business, they were able, by the exercise of strict economy, to show an increased profit over the previous year. The balance to the credit of the profit and loss account was £971; and after payment of a dividend of 4 per cent., there would remain £211 to carry forward. The Chairman (Mr. C. Bryant) stated that it was not proposed at present to raise the price of gas. The Directors had under consideration a very important confidential proposal, the nature of which they were not now at liberty to state. It was, however, of such a nature as to render it desirable that a vacancy which had occurred on the Board through the death of Mr. Vine should not at present be filled. The dividend recommended was declared.

Weymouth Consumers' Gas Company.—It was reported at the half-yearly meeting of the Company that the quantity of gas sold during the past six months was 3·9 per cent. less than in the corresponding half of the previous year, when unusual circumstances calling for a larger use of gas prevailed in the town. The financial results had been very favourable, the increased receipts more than covering the advance in expenditure. After meeting interest and depreciation charges, there remained £7207, out of which it was decided to pay for the half year the maximum dividend at the rate of 5 per cent. per annum on the ordinary stock, less income-tax. The Chairman (Mr. J. G. Rowe) said that coal had cost them 3s. 11d. per ton more than it did twelve months ago; but notwithstanding this rise, the expenditure was £401 less. This was brought about by 1399 tons less being used; the saving having been caused partly by less gas being made, but mainly by better manufacturing results. The gas sold per ton of coal used had risen from 9736 cubic feet last year to 11,397 cubic feet this.

Morpeth Gas Company.—The annual report of the Company shows that the gross profit for the year amounted to £2176. The suspension of public lighting, the restrictions in the lighting of business premises, the rise in the prices of coal, and the increased cost of labour, have made the past year an anxious one. Owing to the large return from residuals, and by economical and careful management, the Directors have not only been able to surmount all difficulties, but to show a profit for the year which is the largest in the Company's history. They are therefore able to pay 5 per cent., free of income-tax, on the ordinary shares, and to add to the carry-forward a sum equal to 1 per cent. on the ordinary capital.

Wages of Metal and Tube Workers.—At a meeting of delegates representing the metal, wire, and tube workers in Birmingham and district, held to consider the question of wages, the following resolution was passed: "That this meeting of delegates hereby declare their earnings altogether too small to live on and to pay rent and clothing; and, in order to help us, our employers be requested forthwith to agree to pay an extra 5s. to day workers and 12½ per cent to piece workers, payable from the first week in July last." Mr. W. J. Davis (General Secretary of the National Society of Amalgamated Brass Workers) said arbitration was out of the question; and 12½ per cent. should be the lowest offered by the employers to settle the dispute.

Waste of Water.—A hint to householders on the subject of the waste of water is contained in an article contributed by Sir John Wolfe Barry to last Tuesday's issue of "The Times." It is pointed out that in London almost every drop of water used in households has to be pumped to a considerable height. The quantity supplied for all purposes by the Metropolitan Water Board, excluding some comparatively immaterial supplies to adjoining public authorities, varies from 33·37 gallons per head in April for the total population of 6¾ millions to 39·56 gallons per head in June, with an average for the year of 35·76 gallons per head. In this way, nearly 90,000 million gallons are annually pumped through 1,129,000 services, or nearly 242 million gallons per diem. This is a more than ample supply in ordinary conditions; but at the present time the writer ventures to say that it is extravagant. It involves an expenditure in coal and oil fuel approximately equal to 190,000 tons of coal annually, to say nothing of wear and tear of machinery, wages, and other items. At present there is nothing to induce householders to economize in water. A certain quantity for trade purposes is charged by meter; but it is not large enough to affect the general consumer, who pays a water-rate based on a fixed percentage of the annual value of his premises. Anything which can generally reduce the consumption of coal is of great present importance; and apart from domestic supplies, the use of pumped water for flower gardens, lawns, golf courses, or similar purposes, whether charged by meter or otherwise, should be everywhere severely restricted, if not forbidden altogether. Efforts should be directed towards the immediate saving of coal and oil fuel in these and all other feasible ways.



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STOCK MARKET REPORT.

MARKETS in the Stock Exchange last week were, if anything, a fraction quieter even than they were the week before; and the prospect of prolonged and increasing quietude is such that the Committee have felt themselves in a position to extend the closure to the first three Saturdays in September. There does not appear to be any ground for apprehension that markets may suffer in consequence; for they are full of strength, and last week the tone was very firm. The factors inducing thereto were, as before, the successful war operations abroad and the comfortable financial position at home. Home Government issues did quite well, and the War Loan was conspicuously firm, perhaps with one eye ahead to conversion at no distant date into something better than 5 per cent. Home Rails continued weak—the labour bogey making buyers shy. Americans were irregular; but Canadians were fair. Argentines started well, but gave way on realization, and did not later recover. In the Foreign Market, Japanese and Mexican issues did best. South Africans were pulled down by profit-snatching on the recent free rise. Among the Miscellaneous group, munitions of war undertakings were decidedly the favourites, textiles coming in a moderate second. Rubber and oil did fairly well; but shipping concerns were not in demand.

In the Gas Market, the aggregate of business done was rather bigger than in the preceding week, but the greater proportion of it was confined to the London and Suburban Companies. These displayed increased strength, Gas Light ordinary rose ½, and Tottenham "A" and "B" 1 each. In the Provincials, South Shields was quoted 1 lower; but no business was marked. The rest were steady generally.

Further progress was made last week with the quotation of present prices of gas securities on the London Exchange; and to these we have been able to add the prices of those Provincial companies in our list which are quoted officially in the Provincial Exchanges.

The Stock Exchange Committee have confirmed the rule, which they recently enacted provisionally, requiring members who have assumed names other than their patronymics to state the disused names upon all business documents.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 66¾ *ex div.*, Gas Light ordinary 78¾, 79, 79½ *ex div.*, ditto preference 74¼ *ex div.*, South Metropolitan 83¾, 84¼, 84½ *ex div.*, Tottenham "B" 90, 90½, 90¾ *ex div.* On Tuesday, Cardiff 5 per cent. 88½, Gas Light ordinary 79, 79¼, 79⅜, ditto preference 74½, ditto debenture 60¼, 60¾, Imperial Continental 90, 91, South Metropolitan 84⅜, 84½, 84¾. Tottenham "B" 90¾, Torquay 7 per cent. 9 13/16, 9¾. On Wednesday, Gas Light ordinary 79, 79¼, 79⅜, 79½, 79¾, 80, Imperial Continental 90, ditto debenture 65¾, 66¼ *ex div.*, South Metropolitan 84⅜, 84¾. On Thursday, Gas Light ordinary 79¼, 80, Imperial Continental 90, Primitiva 43s. 1¼d., ditto preference, 72s. 6d., South African 7, South Metropolitan 84⅜. On Friday, Brentford "B" 83½, Commercial 4 per cent. 75, 75½, ditto 3½ per cent., 70½, 71, ditto debenture 55, Continental Union preference 55, European 13, Gas Light ordinary 79¼, 79⅜, 79⅝, 80, ditto preference 74, 74½, Imperial Continental 90⅝.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4	Aldershot 4 p.c. Pref. .	..	65—70*	..
1,551,868	"	April 29	2½	5	Alliance & Dublin Ord.	59—64	64—66	66¼*
874,000	"	July 10	4	4	Do. 4 p.c. Deb.	76—79	60—65	..
980,000	5	April 29	7½	3/-	Bombay, Ltd. . . .	5¼—6⅜	5—5½	..
50,000	10	Feb. 26	16	15/-	Bourne-mouth Gas and Water { 10 p.c. . .	29—30	26—28	..
333,110	10	"	7	7/-	B 7 p.c. .	15—15½	11¼—11⅝	..
115,000	10	"	6	6/-	Pref. 6 p.c.	13½—14	9¾—10¼	..
159,740	—	—	—	4	4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	56/-	Brentford A Consold. .	261—266	86—88	..
734,920	"	"	†11	55/-	Do. B New . .	204—209	83—85	83½
55,000	"	"	5	5	Do. 5 p.c. Pref. .	109—111	85—90	..
221,400	"	June 11	4	4	Do. 4 p.c. Deb. .	91—98	..	..
217,380	Stk.	Feb. 26	11	10½	Brighton & Hove Orig.	208—218	170—173	..
244,300	"	"	8	7½	Do. A Ord. Stk. .	154—159	125—127	..
530,000	20	Mar. 26	12½	22/6	British	44—45	34½—35½	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	71—73	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1¼—1¾	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref. .	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord. . .	108—110	87½—88½	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	74—76	75—75½
660,000	"	"	5½	46/8	Do. 3½ p.c. do. .	103—105	70—72	70½—71
476,000	"	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	55
800 000	Stk.	"	4	—	Continental Union, Ltd.	76—79	36—38	..
200 000	"	"	7	—	Do. 7 p.c. Pref.	115—118	55—57	55
278,400	—	—	—	11½	Croydon B and C 7 p.c.	..	180—190	..
—	—	—	—	—	Do. E	..	..	..
492,270	Stk.	—	8	5½	Derby Con. Stk. . . .	128—135	..	..
55,000	"	—	4	4	Do. Deb. Stk. .	102—104	..	..
1,002,180	10	July 29	10	10/-	European, Ltd. . . .	17½—18	12½—13½	18
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. . .	98—102	79—81*	78¼—80*
2,600,000	"	"	3½	3½	3½ p.c. max. .	76—79	59—61*	..
4,062,235	"	"	4	4	4 p.c. Con. Pref.	96—99	73—75*	74—74½*
4,674,850	"	June 11	3	3	3 p.c. Con. Deb.	72½—74½	59—61*	60½—60¾
130,000	"	"	10	10	10 p.c. Bonds .	..	..	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	80—85	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16¾	8—9	..
86,600	—	—	—	9½	Hornsey 7 p.c. . . .	..	130—140	..
181,000	Stk.	Mar. 12	7½	7½	Ilford A and C . . .	151—154	115—120	..
65,780	"	"	6¾	5¾	Do. B	115—119	105—110	..
65,500	"	June 26	4	4	Do. 4 p.c. Deb. . .	92—94	73—76	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental .	150—160	90—95	90—90⅞
1,235,000	Stk.	Feb. 12	8½	8½	Do. 3½ p.c. Deb. Red.	84—86	65—67*	65¾—66½*
235,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c. .	119—121	90—95	..
2,498,905	Stk.	Feb. 26	10	5	Liverpool 5 p.c. Ord. { A	211—213	89½—90½	..
					{ B	146—148		
306,083	"	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	88½—89½	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4¾	4—4½	..
250,000	100	April 1	4½	4½	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	8½—9½	..
1,875,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	81½—83½	..
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7/14/0	7/8⅔	North Middlesex 7 p.c.	14—15	11—12	..
800,000	Stk.	May 14	8	8	Oriental, Ltd. . . .	117—122	108—110	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7¾	2—3	..
60,000	50	Feb. 26	13	65/-	Portsea, Island B . .	126—131	95—100	..
100,000	50	"	12	60/-	Do. C . .	118—121	95—100	..
52,000	50	"	10	—	Do. D . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	2—2½	43/1½
499,960	5	June 26	5	2/6	" 5 p.c. Pref. .	4½—5	3 1/16—3 3/16	73/6
521,600	100	June 2	4	4	" 4 p.c. Deb. .	91—98	80—82	..
—	—	—	—	4	" " " 1911	..	..	..
346,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	60—65	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	8½—8¾	..
125,000	50	July 1	5	5	5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	223—224	186—190	..
209,984	"	"	10	10	Do. B	223—224	186—190	..
523,560	"	"	10	10	Do. C	220—222	186—190	..
90,000	10	May 28	9	6/-	South African . . .	10½—11½	..	7
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85*	83¾—84¼*
1,895,445	"	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	59—61	..
224,820	Stk.	Feb. 26	8½	8	South Shields Con. Stk.	157—159	152—154	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82*	..
60,000	"	"	5	5	Do. 5 p.c. Pref. .	110—112	79—81*	..
135,000	—	"	—	48/4	Do. West Kent. .	..	..	..
187,558	"	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	90—92	..
647,740	Stk.	May 14	5	5	Southampton Ord. . .	99—102	90—95	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham { A 5 p.c. .	135—138	120—123*	..
782,275	"	"	6	6	B 3½ p.c. .	115—117	90—92*	90—90¾*
181,255	"	June 26	4	4	District { 4 p.c. Deb.	87—89	73—75	..
189,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	93½—94½	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	Feb. 26	8⅝	78/9	Wandsworth A 5 p.c.	151—156	117—122*	..
255,636	"	"	6⅞	63/9	" B 3½ p.c.	129—134	101—103*	..
108,075	"	"	5/17/8	55/1⅛	" C 3½ p.c.	110—115	88—93*	..
852,000	"	"	6½	57/6	Wimbledon 5 p.c. .	117—122	93—98*	..
98,000	"	"	6⅝	63/9	Epsom 5 p.c. . . .	121—126	98—103*	..
98,416	"	June 26	8	8	8 p.c. Deb. Stk.	65—69	53—56	..

* Ex. Div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER (4-Million Works). No. 6217.
WORKS SUPERINTENDENT. No. 6216.
WORKS CHEMIST. No. 685, care of Sell's Advertising Offices.
WORKS FOREMAN. Lancaster Gas-Works.
GAS-FITTER. Sevenoaks Gas Company.

Appointments, &c., Wanted.

CHEMIST (French and English). No. 6215.
ENGINEER, MANAGER, SECRETARY, OR MANAGING-DIRECTOR. No. 6214.
FOREMAN (TAR DISTILLATE, &c., PLANT). J. Ashworth, Darlington.

Gas-Works for Sale or To Let.

E. M. HOPE, Meldreth.

Patent Licence or Sale.

GAS MANTLE MANUFACTURE. D. Young and Co., Southampton Buildings, Chancery Lane.

Plant, &c. (Second Hand), for Sale.

PIPES. Ocean Coal Company, Rhondda.
TYPEWRITER. White, Northampton.

Plant, &c. (Second Hand), Wanted.

AMMONIA STILL. Brotherton and Co., Leeds.

Electrical Engineering Courses.

E. A. MANSFIELD AND CO., New Brighton.

Sales of Stocks.

HARPENDEN GAS COMPANY. Tenders by Sept. 12.
ROCHESTER, CHATHAM, AND GILLINGHAM GAS COMPANY. Tenders by Sept. 21.

TENDERS FOR

Carbon. No. 6192.

Tar.

GUILDFORD GAS COMPANY.

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